CQ CONGRESSIONAL TRANSCRIPTS
Congressional Hearings
April 8, 2003

House Appropriations Subcommittee on Veterans Affairs, Housing and Urban Development and Independent Agencies Holds Hearing on FY2004 Budget Request for NASA

WALSH:

The subcommittee will come to order. Let me begin by apologizing for keeping everyone waiting. I don't like to be kept waiting and I don't like to keep other people waiting.

There was a little confusion about when the hearing started today. And it was a big night for me, so I was enjoying myself.

Welcome, Sean -- Administrator O'Keefe. And congratulations to you for Syracuse University's success. I know you had a good part of your history there too.

This morning's subcommittee hearing is on the fiscal year 2004 budget request for the National Aeronautics and Space Administration. The budget request totals $15.5 billion, an increase of about $130 million compared to fiscal year 2003.

Testifying for NASA will be Mr. Sean O'Keefe, a former constituent of mine and the administrator of this important scientific agency. This budget comes to us with a cloud hanging over us, that being the loss of the Shuttle Columbia and its crew.

I had a special connection with the Columbia mission. A high school in my district had an experiment on board the shuttle. And I had attended the launch and other events leading up to the launch, where I met the crew's family and others involved in the mission.

The purpose of the experiment developed by the students at Fowler High School in Syracuse was to test the effects of microgravity on a colony of harvester ants. The students saw their project postponed for close to three years, due to delays in the launch schedule.

But they learned the value of patience and determination on the road to success, as the shuttle was launched on January 16th. And I remember that day vividly.

After 16 days of downloading interesting and potentially valuable data, the students had a sense of ownership of STS-107 Mission. The loss of the Columbia and its crew on February 1st was therefore a personal loss to these students. And in the days following, the students made a commitment to see the project through to completion as their tribute to the Columbia crew.

It is safe to say that many students at Fowler were inspired by their work. And perhaps a few may select the fields of science, math and engineering -- and Lord knows, we need them -- as lifelong careers as a result of this mission.

In the aftermath of the tragedy, there will be debates about the future of the space program and the needs for humans in space. While we don't want to run a multibillion program simply to excite kids about science, its importance must not be diminished.

With that said, I am pleased to see your budget request includes $26 million for a new education initiative, with such components as explorer schools, explorer institutes and a scholarship service program. I will have some questions for you regarding this initiative as we get further into today's hearing.

Also included in the budget request are eight other new initiatives as you have defined them. While we have seen some of the components of these initiatives in previous budgets, the increased emphasis will be welcome, in particular with regard to the human

research initiative and the aviation security initiative, two areas this subcommittee has actively supported in the past.

The subcommittee will consider many issues, as we review your budget, including the recommendations of the Columbia Accident Investigation Board, if they are able, in time for our consideration. We may have some minor changes as we work toward completion. But we are ready and willing to work with you to ensure that we give you adequate resources to do your job, as we develop your final appropriation for fiscal year 2004.

Before I ask you to present your statement, I would like to call on my good friend and colleague, Mr. Mollohan, for any opening remarks you may have.

MOLLOHAN:

Mr. Chairman, thank you. Welcome, Mr. Administrator.

NASA is facing uncertain and challenging times. Thus, it is going to be very difficult to answer many of the questions that we have. We don't know when the shuttle will fly again, although we certainly hope they will return to service sooner rather than later.

We don't yet know the full impact that the shuttle grounding will have on the International Space Station or on scientific research. What we do know is that this budget requests a mere one percent over 2003 funding levels. This continues a too long trend for this agency.

Clearly, you are to be commended for being able to identify and propose new initiatives that will further our scientific capabilities and yet still maintain the support for so many ongoing missions. However, this agency can do more. For example, rather than settle for a crew return vehicle and the orbital space plane, we could be investing in a replacement for the shuttle.

But as you know, large initiatives require large investment. Thus, we need to be focusing on the future of the agency, identifying long-term goals and the resources needed in achieving them. Only then can we make an educated decision on what initiatives to pursue.

I look forward to your testimony, Mr. Administrator.

Mr. Chairman?

WALSH:

Thank you, Alan.

Mr. Administrator, please proceed with your testimony. Your entire statement will be included in the record. And if you care to summarize, we would appreciate that.

O'KEEFE:

Well, thank you, Mr. Chairman. I appreciate it very much. And indeed, it was a big night last night for us longsuffering Syracuse University fans and former faculty members and grad students of there. It was a huge evening. So I appreciate your acknowledgement of that mutual satisfaction.

Try to touch on four points and do it quickly and take you up on your offer to quickly summarize the statement. First of all, I want to touch briefly on: the Columbia accident investigation and the progress thereof; the International Space Station and our current plans and where that effort continues apace; and to touch on the return to flight planning, in terms of our efforts to start thinking now constructively about what we can do to prepare ourselves for the opportunity to return to safe flight as expeditiously as possible; and then touch on a couple of budget highlights.

First and foremost, as it pertains to the accident investigation progress, the investigation board and the Gehman group overall, I think, are moving apace at an accelerated level at this stage. They have narrowed down the field of issues that they are considering. They have done a very disciplined, extremely methodical work to try to look at every possible contributing factor of what could have led to the Columbia tragedy and, in turn, have eliminated various factors, in turn, and have begun to narrow their field of vision in terms of what they believe were the cause or probable cause circumstance that led to it.

And from my discussions with Admiral Gehman and his board membership as recently as last week, I think it can best be summarized as their findings and recommendations will center around hardware failures or concerns, as well as process failures and concerns. And they are guiding us, in many ways, even at this stage, to point in directions of where those hardware and process reforms can be made. So we're moving apace on that.

As it pertains to the recovery operations, roughly 30 percent of the dry weight of the orbiter has been recovered over the course of these last two months of intensive coverage on the part of 20 different federal agencies, state and local law enforcement and other officials in Texas and the immediate areas around the east Texas and west Louisiana areas. Roughly 6,000 people are still involved in that activity, from the U.S. Forest Service, the EPA, NASA, to be sure, FEMA and several other agencies that are participating.

The concentration of the debris field on this particular chart kind of gives you a quick visual where it is. To the left of Toledo Bend, which is the separation border line between Texas and Louisiana, the blue dots indicate the highest concentration of debris. So it really was heavily concentrated in an area of about 240 miles long and about 10 miles wide.

And so the approach that the Forest Service and the EPA and NASA are taking -- the three primary agencies in terms of numbers of folks on the ground, along with the Texas Forest Service and others -- is essentially to walk a grid every day with particular precision. You may have noticed the coverage of about 10 days to two weeks ago, the recovery of the recorder that was in the crew compartment aboard Columbia, was on a grid map which was specifically covered by a fire team of U.S. Forest Service folks.

They missed it. And based on the debris finds that were categorized and analyzed, the approach that was taken was to specifically go back and cover that acreage again, in which case they found, on the second sweep, the recorder itself.

So there are a number of very high value or high target "hot list" items that we have identified that the folks on the ground -- nearly 6,000 folks -- are looking for in a very concentrated manner. So that's heading apace and doing an impressive job.

We intend to wrap up the operations there in the next four to six weeks. At this stage of the game, the coverage of acreage in that span of time has been impressive. Roughly 75 to 80 percent of the actual acreage area has been walked.

And the concern is to not only recover pieces for the investigation purposes and to guide the Gehman Board's review, but also to look specifically at the concerns with public safety, to assure that the hazards of some of the items and parts of the orbiter that were recovered do not remain there for hazard to public safety.

Moving to the International Space Station plans, the current effort, on the 26th of April, we will launch a Soyuz craft in Russia -- or in Kazakhstan, actually. And the Russian Space Agency will sponsor that effort.

There will be one U.S. astronaut and one Russian cosmonaut aboard. They will constitute Expedition Seven, which will then dock

with the International Space Station on or about the 28th of April, spend some time there on a crew exchange, with Expedition Six, which is the three crew members aboard right now -- commanded by Ken Bowersox, our science officer, Don Pettit and engineer-cosmonaut Nicolai Budarin -- will then board the currently docked Soyuz emergency egress capsule and come back on or about the 4th of May.

So that the intention is to maintain a two-person crew for the foreseeable future, or at least until we can return to flight for the purpose of maintaining the International Space Station and conducting a limited science package, but nonetheless keeping the station activities apace.

It's important to remember that we are roughly two-thirds of the way towards completion of the International Space Station, in terms of its core configuration. Another six flights are planned as soon as we can return to flight, that will complete that core configuration of the asset and laboratory capability that we know as International Space Station and then permit the installation of additional modules and components to build out that capability in the time ahead.

As it stands now, again, the objective is to support the International Space Station through the twice a year flights, as had already been planned before the Columbia tragedy, to replace the Soyuz egress capsule, but also to now accelerate the number of unmanned logistics flights -- progress vehicles, they are called -- to what should be about four this year, throughout the balance of this calendar year, and then thereafter support all the consumables -- water, food, as well as spare parts requirements that the space station may have.

So for the foreseeable future, and for as far as we can project, that is a sustainable effort to maintain and keep that capability, without compromise to the integrity of the International Space Station laboratory itself.

The third feature I mentioned is return to flight planning. Our efforts, based on all the indications we have received from the Gehman Board, is that their intention is to begin the process soon of releasing findings and recommendations, in terms of what they view to be -- as I mentioned, Mr. Chairman, at the front -- either hardware or process-related issues that contributed, in their view, to the tragedy. Then in turn, to anticipate that we would implement those findings as expeditiously as possible and to prepare for safe flight resumption as quickly as we can.

So we're beginning right now to look at the findings and recommendations that are being forecast to us by the Columbia Accident Investigation Board and begin down the road towards the efforts that would be necessary to resume flight as expeditiously as we can. That will include, again, a range of not only hardware, but also process changes that we would implement along the way.

And finally, sir, a quick highlight of some of the budget issues that are before you and requested of Congress as a result of the president's February 3rd submission. Just to highlight, I guess, a general set of themes, we view the budget that was forwarded, again prior to the Columbia tragedy, but still in our view very focused towards the kinds of issues that need to be concentrated, in terms of what this agency has been chartered to do for exploration, discovery, research and development activities, as a responsible, credible and -- we hope to believe -- compelling set of issues that will advance those charter objectives as well.

O'KEEFE:

Some of the quick highlights are, first and foremost, there are two areas that we have concentrated on very, very specifically this year, with the intent of trying to find a technology, as well as capability, breakthrough, as an opportunity to explore in the space exploration and discovery objectives in a different manner than we had heretofore. First is an effort referred to as Project Prometheus, which is an effort to develop propulsion and power generation

capabilities, which we anticipate will at least improve the speed of transit for any space exploration objective by a factor of at least three, but more importantly, establish an on-orbit kind of capacity, which we currently do not have.

As it stands now, every space exploration objective and probe that's commissioned by NASA is a one-shot opportunity. And if you do not get it on the first pass, that's the only pass you'll have a chance to do.

When you consider the distances just in this solar system, we're talking about the extent and breadth of the solar system, using current propulsion and power generation capabilities, would require the transit, if we began today, of a 15-year excursion to the end of this solar system. Then we'd get one shot, one opportunity on a fly-by to make use of that investment of time, as well as resource, to inform that science and research agenda.

So our objective is to develop a capability which will speed the transit, as well as provide an on-orbit capability, to have several examinations of capabilities in the course of that time. That would constitute one of the largest individual breakthroughs of capability that NASA could possibly pursue, in terms of power generation and propulsion capabilities.

Concurrent with that is also a human research initiative, which is to try to establish and understand what we need to do in order to sustain, for any length of time and for long space flight endurance opportunities, any kind of exploration objectives that we may seek in the future for human space flight opportunity. As it stands now, our longest duration space flight is 196 days, just achieved last June by Dan Bursch and Carl Walz, two astronauts who have several missions to their capability prior to the time they were aboard International Space Station.

That is the maximum time that we have had up there. And as a result of the physical consequence on astronauts on International

Space Station, or for any other longer duration effort, has typically showed a very significant human reaction to that particular case, in terms of muscle mass, bone mass loss, as well as radiation exposure, which is quite severe.

Until we can fully understand exactly what the consequences on human beings are, our understanding and capability to really look at longer duration space flight is limited. So we're really putting a tremendous amount of effort into a human research initiative here to really try to combat the consequences of long duration space flight for any opportunities we may see in the future.

Beyond that, there are five major issues that we're looking to. And Mr. Chairman, you mentioned one in your opening statement, as it pertains to our education initiatives.

That is a very fundamental piece of what we believe is a part of the mission charter of NASA from when it was founded in 1958, is to pursue the education objectives as a means to develop not only capabilities within the larger national sphere. But as I think as you alluded in your opening statement, sir, our immediate concerns for the near future is the opportunities to develop engineering, scientific and technology-related kinds of capabilities for the near future, given the retirement rates that we're seeing and forecasting for the years ahead.

Also our efforts on climate change research, we represent and constitute about half of the national assets that will be employed for the continuing efforts in the president's initiative for climate change research. And in partnership with our friends at the Department of Commerce and elsewhere, our efforts are to fulfill the objectives that he has charged in that respect.

Three very important initiatives on the aviation side of the equation is: an aviation security initiative to look specifically at trying to reduce the vulnerabilities of aviation to terrorist and criminal attacks, to focus on that aspect and to coordinate with our friends at the

Homeland Security Department in that endeavor; a national airspace system transformation augmentation, which is to develop the technologies to address efficiency, capacity and security needs at commercial aviation terminals and to improve the airspace management opportunities there; development of a quiet aircraft technology to work on significantly reducing community noise impact that has already seen some dividends, but we need to do much more.

And finally, sir, on the last two points I would observe is that the budget before you and requested for the first time fully funds the International Space Station at a level that has been confirmed by three different specific cost estimates. This is the first opportunity that I am aware of that we have had a chance to at least present a budget that is universally considered to be resourced to the level necessary to actually conduct the operations and to complete the international space station in the manner that it was intended.

So our objective there is to proceed ahead as forecast, not only for fiscal year '04, but also for the outyear projections that have been confirmed by each of those independent cost estimates and will stand by the program management transformation that has occurred there over the course of the past year.

And finally, the integrated space transportation plan, to you, Mr. Chairman and Mr. Mollohan, I want to thank you both and the committee for your extraordinary endorsement of the president's amendment that he forwarded on November 13th of last year for the fiscal year 2003 budget that began the process of the integrated space transportation plan and all the elements of shuttle service life extension, the orbital space plane effort, the next generation launch technologies and a range of other supporting activities, in order to assure that the International Space Station and our efforts to go beyond low Earth orbit in the future are potentially achieved.

That effort endorsed, entirely by the committee and the Congress as part of the 2003 Omnibus appropriations measure, has been

continued specifically in the manner that we had amended the budget or in accordance with the president's request back in November, is exactly the same configuration of resource commitments that we intend for an integrated space transportation profile.

So with that, sir, I thank you for the opportunity to summarize the program and also to give you a couple of highlights on a few other aspects that certainly are very important to us at this juncture.

Thank you, Mr. Chairman.

WALSH:

Thank you very much for your testimony. And before I begin, I would just like to make note that there are a lot of people here who were involved in that shuttle and involved in the NASA family, as I have learned to call it -- government employees, contractors, ancillary staff, across the board families. And I know you have been through a lot. And we appreciate that.

There is a lot of sensitivity for that loss here in the Congress. We felt very badly about what happened too.

And we know we have to move on. And we need to move on also.

But there is a way -- there is a certain way that we can all move on. And when I read your testimony last night, Mr. O'Keefe, you mentioned an accident that had occurred back in 1908 on the Wright Flyer, Orville and Wilbur Wright's flying machine, and how an army lieutenant who was observing that flight was killed in one of these training runs. And he died of head injuries. And the crash helmet, the flight helmet, evolved from that accident.

Obviously, if they had backed away at that point, the world would be a very different place. And I suspect that if we back away from the inherent desire in humanity to move forward and to find new horizons and make new observations about themselves and about

where they live, the world would be a very different place in the future too.

So I'm glad you made note of that. And I just thought it was worthy of comment.

I'd like to ask a couple of questions about the Columbia accident and then I'll move on. But the cost thus far of the recovery, do you have an idea of what that cost is?

O'KEEFE:

We have worked very closely with FEMA or the Federal Emergency Management Agency, in our efforts to try to pull together all of the recovery expenses. The president declared a disaster condition at the very beginning of this circumstance, so FEMA has handled all of the resources necessary there.

So far, they have incurred on the order of about $160 million to $170 million of cost in reimbursing other federal agencies, state and local governments' activities, the National Guard when they were first called up, the range of other expenses in that respect. NASA's responsibility is for the investigation aspect of this, as well as for our own activities. And the appropriations bill included a $50 million appropriation specifically to cover that. At this juncture, the incremental cost that we anticipate should be well within that.

The total cost of what we expect, when you calculate not only the contracts, but also the individual activities on the part of NASA personnel, may exceed that number. But we'll see where it goes, in terms of how far the Columbia Accident Investigation Board continues its efforts. But right now, we're tracking well in that regard.

WALSH:

This has been done -- coordinated by FEMA, correct?

O'KEEFE:

Yes, sir.

WALSH:

Are they looking internally to bill NASA for these expenses?

O'KEEFE:

No, sir. It is a -- the two separable parts are -- the recovery assistance activity is covered by the disaster assistance appropriation that certainly is made available by Congress for the purposes of those cases. There again, they have run about $160 million to $170 million of cost.

What they anticipate, from this point forward, certainly ranges over $200 million. But what their current estimate is right now, I'd have to defer to FEMA to give you a direct cost on that.

The second part is our investigation efforts, which again we believe are certainly within the range of the $50 million that the Appropriations Committee has made available for that purpose. We'll look at what that does, in terms of outyear -- or I'm sorry, the burn rate beyond May and see what additional costs may be incurred there on a total cost basis and advise accordingly.

WALSH:

What's EPA's role thus far?

O'KEEFE:

They have really done a spectacular job. There are better than 800 to 900 folks from EPA. Their primary task is to deal with the public safety concerns. Upfront, early on, the debris that was recovered had a potential hazard to the public by virtue of the -- not only the fuel, but also toxins that were on certain pieces of the orbiter, that if touched by citizens in the area, could have been very damaging.

So they have been very, very methodical in helping us treat the pieces that have been recovered, prepare them for further investigation and examination capabilities and have done a spectacular job. Between they and the U.S. Forest Service, that's been the primary capabilities, in terms of numbers, of folks that have been on the ground. And they have done an amazing job.

Just having been there about 10 days ago, it is an extremely well organized and seamless interagency process that I've never seen anything quite like.

WALSH:

Regarding the Gehman investigation, during the initial recovery and response activities, NASA had assigned top-level space shuttle program management personnel who were involved in the preparation and operation of STS-107 to a role of supporting the Columbia Accident Investigation Board. On February 25, Admiral Gehman, the chairman of the board, asked you to reassign these individuals back to their duties and remove them from directly managing or supporting the investigation and replaced them with other knowledgeable people.

Did you agree with Admiral Gehman's assessment at the time that leaving these top-level program management personnel in place would present a conflict of interest since these individuals had been involved in the preparation of STS-107?

O'KEEFE:

Well, more importantly, what Admiral Gehman and I agreed to was that the interface between NASA and the Columbia Accident Investigation Board was more appropriately configured along the three areas that he has arrayed his board membership -- of technology, operations and management functions. And so as a consequence, we're really trying to -- and we did -- reorganize our efforts to interface with that directly.

So all the folks that were associated with the STS-107 operations are not direct interface with the Accident Investigation Board. And that's the configuration we have set in motion.

It is now two of the deputy directors of two of the space flight centers, as well as the chief of engineering from Johnson, who are three interface personnel, who had nothing and no operational responsibility for the conduct of STS-107.

WALSH:

Do you believe that NASA's support for the investigation has been fair and unbiased from the outset?

O'KEEFE:

Yes, sir. We have done our very best to make sure that is.

WALSH:

My last question: one of the contractors involved in this accident, Spacehab, has one customer. And they lost everything in that shuttle tragedy.

How does a company like that -- and there may be others -- that have their total product base is tied up with one customer and one event, how do they -- are they compensated for their loss? And does NASA have any responsibility there?

O'KEEFE:

Well, commercial firms typically establish or take out insurance policies for what they view as their potential liability as a consequence of any operational hazard or circumstance that may otherwise be encountered. In this particular case, I am told that there are insurance provisions and premiums that had been covered as cost of indirect overhead from their service activities as well.

But in terms of looking at what their total loss and their liability is overall and whether that covers it, we're endeavoring to get together with them here, I think later this week, to try to ascertain what that full amount of exposure is. But as a general proposition, as like any other government activity or public interest in these cases, the contractual commitment is to assume that there will insurance liability coverage on the part of carriers, rather than for the U.S. government to assume that, unless otherwise so stated. And in this case, it specifically was not.

WALSH:

Thank you.

O'KEEFE:

Thank you.

WALSH:

Mr. Mollohan?

MOLLOHAN:

Mr. O'Keefe, some have suggested that in light of the Columbia tragedy, that the risks of manned flight are just too great to justify the reward. I'd like to hear your thoughts on that.

O'KEEFE:

If that had become a dominant viewpoint throughout the course of human history and exploration, we'd still be living in caves today. I think it is an instinct written in the human heart, I think, that we proceed with exploration and discovery objectives, quantify and try to manage the risk as best we can, but recognize constantly that these are very difficult endeavors and ones that challenge us.

And in this particular circumstance, the risk clearly was high. There is no question about it. But we are still going and doing things that have not been done before.

And in the process of doing so, we've got to really manage those risks as much as we can within the limits of human frailty and try to avoid any circumstance like this. Something went dangerously wrong. And we're going to find out what it was, fix it and resume safe flight as expeditiously as we can, but only on the condition we can satisfy ourselves that safety is preserved as a means to go about doing so.

But to ignore the objectives for exploration and discovery would be a step backwards.

MOLLOHAN:

Well, assuming as we all do that the shuttle is safely returned to flight, at what point do we need to begin the process of determining space policy priorities of identifying the next great challenge and quantifying the costs and the benefit of such an undertaking?

O'KEEFE:

Yes, sir. Well, I'd like to suggest that we've done just that as part of the 2004 budget submission. Our strategic plan that is, for the first time, submitted with the budget -- and put together well before the tragedy of February 1st, unfortunately and so therefore, has not gotten much coverage to speak of -- is a comprehensive effort to look at: how do we identify the enabling technologies necessary to identify longer-term and more broad-based exploration and discovery objectives than what we are currently engaged in?

Certainly, as I mentioned in the opening statement, Project Prometheus is a very clear example of that opportunity to use that enabling technology to develop power generation and propulsion capabilities to expand well beyond the kind of low Earth orbit kind of

space exploration efforts that we have been engaged in thus far. Beyond that, understanding human endurance, as well as the technologies necessary to engage in any planetary exploration, is what this particular budget proposal before you attempts to do and to set the stage and the groundwork in order to make that possibility of future exploration objectives a reality.

MOLLOHAN:

Obviously, the tragedy always puts us at a bit of a crossroads and a time for reflection. I'm certainly pleased that through the shuttle life extension program, you're taking a holistic look at the upgrades that the shuttle will need to be made a safer vehicle, as the expected use life stretches. But the research and investment in a replacement is likely to suffer as a result.

How do you propose to address the need to maintain and improve shuttle, develop the orbital space plane and invest in new technologies to make the next leap forward in our ability to access space in a more affordable manner?

O'KEEFE:

Yes, sir. I appreciate the question. And that's precisely the issue that we have been wrestling with and trying to determine what the appropriate balance is.

And what we've lit on, I guess, as part of the integrated space transportation plan that was submitted as part of last year's amendment to the '03 budget and is now manifest in the '04 request before you, is a very specific effort of trying to look at what it will take to maintain operational shuttle capacity, primarily for its cargo lift capacity. That's its main attribute that we cannot really duplicate with almost any other capability. Or we'd have to develop it at excessive cost or cargo lift, heavy lift capacity requirements to finish International Space Station, do servicing for Hubble telescopes, et cetera.

Second dimension is to look very specifically at the orbital space plane as a technology demonstration to establish maneuverability and flexibility of launch. Those are two characteristics that have bedeviled us with shuttle over the course of the last 15 years of operation, in which there is very limited maneuverability, very little flexibility in terms of the launch window. And so there's an opportunity to look at using that capability to become the crew transfer vehicle to International Space Station, is to really limit and look at those two technology or technical limitations that must be conquered in order to look at anything beyond that.

The third element, as you have mentioned, is to look at the next generation launch technologies, which would then be used for the purpose of beyond low Earth orbit kind of exploration opportunities and using the capabilities and technology demonstrated by orbital space plane, while at the same time using the shuttle with a continued heavy lift cargo capacity. It does all three of those dimensions in a way that is more integrated than ever before.

MOLLOHAN:

Thank you.

O'KEEFE:

Thank you, Mr. Mollohan.

WALSH:

Mr. Hobson?

HOBSON:

Thank you.

Mr. Administrator, nice to see you here.

O'KEEFE:

Good to see you, sir.

HOBSON:

I'm going to ask one question and then I'll come back later on. But my responsibility is not only on this committee, but I'm chairman now of Energy and Water and I sit on Defense. So I look at a lot of different things.

I ran into your very able associate, Charlie Horner, who I knew from another life he had. And we got to talking about . . .

O'KEEFE:

That's a subjective statement on how technical he is. But I'll take that as a . . .

(LAUGHTER)

HOBSON:

I became concerned about something in my new job, which is the loss of U.S. leadership in high-end computing technology. And I realize that HEC is a niche industry. However, it's a critical capability, due to its impact on federal agency missions ranging from national security defense to basic science.

And I was expressing this to Charlie. And he said, "Well, you know, we're looking at some stuff." And then I went over and I found out that NSA is looking at some stuff. And the DARPA is looking at some stuff.

And all of a sudden, I'm thinking, "Where are we going here?" There's nobody -- I'm concerned about the coordination of this, making sure that your needs are met and other people's needs are met. Because we have a gap here. And we need not only to bridge the gap, but we need to look out in the future.

And I assume that, from my conversations, that you have some role in this, in HEC. And I'd like you to do a couple of things that would clarify for me what your role is. Do you have adequate funding? Or do we all need to work together in some way to get this done to coordinate this?

So I'd like you to run through this because there is no czar that I can find yet that's looking in this area. And I don't want to particularly be that czar because I don't know this stuff. But it seems to me that we're going to have to spend a substantial amount of resources to not only catch up, but figure out where we go in the future.

And does NASA have a role in this?

O'KEEFE:

Yes, sir. You betcha.

First and foremost, I'm going to get you a very complete answer, thanks to Mr. Horner's entreaties to you. We'll be sure that he gets the assignment for giving you a very thorough response here . . .

(LAUGHTER)

. . . because he clearly understands it.

As it pertains to the coordinator, there is, I am advised, just recently the Office of Science and Technology Policy, Dr. Jack Marburger's office, has initiated a high-end computing revitalization task force. So he is the single point of contact guru for trying to pull together all of the agency activities in this regard.

Certainly, Defense, Department of Energy and the National Science Foundation are the three primary lead agencies. But our interest in this is two very dominant areas. The first one is, as it pertains to airspace management and air traffic security and safety kind of considerations, this is our opportunity, I think, to really utilize computing capabilities, particularly at places like Ames Research

Center, that's focused on air traffic management system improvements, as an opportunity to use that capacity in a way that really will deal with some of the air traffic commercial issues we're dealing with right now in a more constructive way. So we've pushed about $65 million into the request this year specifically to deal with high-end computing kind of focus.

The second area is in dealing with an upgrade to what has come screaming home to me, I think, as a consequence of the Columbia accident, that our efforts and capabilities in looking at trend analysis is really behind the curve. And so we're using a high-end computing kind of capability. But we ought to have the capacity to access information, to look at trend analysis of events and circumstances over the course of a shuttle operational condition and see what patterns emerge.

And it appears as though the effort that certainly the accident investigation board has focused us to is when we find a problem, we're all over it and as hard as we know how in order to correct it. But in looking at analyzing trends and what patterns are emerging, we really are not nearly as far ahead as we could be. And the high-end computing area is going to give us the capacity to do that, as part of, I think, the recommendations that we've been looking at previously.

So for those two areas alone, we have a vested interest. But we're seeking to coordinate that with Jack Marburger's task force and to focus very specifically with those three primary lead agencies in order to do that in a more effective way.

HOBSON:

I would think also in modeling, you may be able to do some things that you can't do today, especially with some of the types -- for example, the one that the Japanese have had a specific purpose when they built it, which is the weather type of thing. But we're finding it has other uses.

And one of those may be, in some of those environments to, as we look at them out, is to do some modeling for future types of craft, future types of engines or propulsion types of things that are out there that we don't have the capability today. And I would hope that you would all look at that and look through this.

O'KEEFE:

Yes, sir.

HOBSON:

And we're going to try to see how we can interface with that, both with this committee and the other committee. So we look forward to working with you, sir.

O'KEEFE:

Thank you, sir.

HOBSON:

And good luck to you. You're doing a great job.

O'KEEFE:

Well, thank you, Mr. Hobson. Appreciate it very much.

HOBSON:

Even in spite of Charlie.

O'KEEFE:

We all our bears to cross.

(LAUGHTER)

HOBSON:

I know.

WALSH:

Mr. Price?

PRICE:

Thank you, Mr. Chairman.

Mr. Administrator, welcome to you and your colleagues. Let me first share in the sentiments that have been expressed by others here this morning, sentiments of respect for those who died in the Columbia tragedy and condolences to their families and to those of you who worked so closely with them.

This tragedy has, as numbers of members have already said, has prompted a discussion of the relative payoffs of manned and unmanned space flight. And I'd like to seek out your views on that a little further as we begin this morning.

You have said -- and I agree -- that this should not be seen as an either-or proposition. We clearly need to advance on both fronts. We must continue human space flight and exploration, both because of the direct scientific payoffs and also because of the intangible values of human aspiration and inspiration.

But what is the balance? I think that's the question. What is the balance between the two?

How would you compare the research payoffs from manned and unmanned flights? We're aware of the space probes and the Mars exploration, the Hubble telescope. We're also aware that it took a human flight to make the Hubble telescope operative.

But still, we're aware of the extraordinary research payoffs of these unmanned flights. Is there anything on the manned side that comes close to matching that?

And how would you assess the funding balance? Do you expect that one-half of the NASA budget will be -- and should be -- still devoted to human space flight?

And finally, is there any danger of crowding out unmanned exploration, of seriously underfunding that aspect of the budget and therefore falling short of our potential?

O'KEEFE:

Thank you, sir, for that very cogent analysis of exactly the challenges we are confronting in finding that balance between human space flight and what are really unmanned probes and capabilities that can, I think, impressively augment the science and research agenda.

But the balance is, as you alluded to, is making that determination of where the requirement for human intervention is imperative and otherwise the capabilities would be lost were it not for that capability. And your example of the Hubble telescope is exactly the right one.

Ten years ago, this was roundly considered to be a billion dollar piece of space trash and was determined as not a usable asset. It was all kinds of technical challenges that had been discovered as soon as it became somewhat operational -- or at least when it was turned on. And as a result, were it not for the human intervention and the capacity to make adjustments, we would have had to write off that asset. There is no way that you could make those kinds of changes from the ground.

And it really turns on not only the extraordinary capabilities that humans can bring to it and their technical prowess and capability, but sometimes, it turns on the most subtle of features. I'm sure this was not a design issue that anybody really thought about that much.

But at the time that the Hubble was first designed, all the control panels were installed on the left hand side of the internal workings of the telescope itself, which meant that when you're on a space walk and in a suit and trying to reach across your face in order to make those adjustments, as most of us maladied right-handers would have to, it makes it extremely difficult to do that with big bulky gloves and everything else.

So it turned out the guy who was the most valuable fellow in this enterprise was a fellow named John Grunsfeld who is a leftie. He is an astronomer, an extraordinarily bright guy, all that. But he's a southpaw.

And as a consequence, it made his technical prowess all that much more attentive on this last mission that improved the Hubble telescope by a factor of 10. Now it had been returned to some usable condition before that. But this last mission a year ago, on Columbia -- the last successful mission of Columbia, as a matter of fact, a year ago last month -- made that an extraordinary asset we simply could not do without human intervention.

Beyond that, there are a range of science and research objectives on International Space Station and certainly aboard the STS-107 flight. That was a good example of the kinds of capabilities that would be brought forward that, while the litany is impressive and we can certainly provide a very strong lineage of the kinds of things we see as results from human space flight objectives, none less than Michael DeBakey, the heart surgeon of great renown, attributes human space flight as the primary factor that helped him determine and ascertain the latest invention of the heart pump that he has just patented and made universally available to all of us.

So there is a number of different spin-off efforts that have come from this. But more importantly, I think it is an effort where we really have to strike that balance very carefully, recognizing the extraordinary risk and moving forward.

Finally, I would simply submit that roughly on the order of two- thirds of the budget that we have submitted to you is focused on efforts that would not require human intervention in those cases. And as much as flight does, as you suggested, compose on the order of about $7 billion of the $15.5 billion that we have proposed, much of what they do within the human space flight arena is not necessarily directly and exclusively related to that activity.

So an awful lot, the dominance of what we do, is still very much focused on unmanned effort. And the largest single increase that we see in the budget this year -- and for the past several -- is in space science, which are unmanned efforts that are specifically focused on exploration of the universe.

So I thank you for the question, sir. I appreciate it very much.

PRICE:

Thank you.

WALSH:

The gentleman's time has expired.

Mr. Knollenberg?

KNOLLENBERG:

Chairman, thank you very much.

And welcome, Mr. Administrator. Glad to see you here. Thank you for all the work that you do and also for the trying times that you've been through. And I will associate my comments with those that have been rendered by other members, that we want to see NASA succeed.

And obviously, I'd like to look to the future a little bit in terms of focusing on the future. And one of the programs that you are

funding, which I believe to be one of great interest. I don't understand it entirely. But believe me, I believe that it's something we should look at -- nuclear systems initiative, the Prometheus adventure, I guess.

This system, I understand it, is virtually guaranteed, should it be successful, to reduce the need for food, for fuel and oxygen on trips. One of the things that I thought was sort of interesting is that it allows us to drive spacecraft directly to planets, instead of fly-bys.

I guess what that really means is it shortens the time that it takes to get to Mars, for example, by shortening it from six months to two months. I presume that is an unmanned situation at the moment, is it not?

O'KEEFE:

Yes, sir.

KNOLLENBERG:

And then you have a Project Jupiter, the JIMO, the Jupiter Icy Moons Orbiter, which is destined to be flown within the next 10 years. Is that on target to be done?

O'KEEFE:

Yes, sir. Very much, sir.

KNOLLENBERG:

And then one of the things that interests me about this is it kind of looks -- we have to lean in and look at the focus on NASA in terms of its aging population, its workforce. I understand that 15 percent are currently eligible to retire; five percent -- I beg your pardon, 25 percent will be in five years, they tell me. And this means that we have to attract young people in the colleges and universities where

such a program exists so that you will have the kind of workforce you need to perform some of these things.

When do you -- well, I said within the next 10 years, you hope to do the JIMO project. Are you working with the Department of Energy to attract top scientists to advocate for these university programs? I know I've asked for -- and I believe there is report language in last year's bill that suggests strongly that we look at that and focus on bringing those young people in. But they have to know that there is something out there for them.

What are we doing? And particularly, what are you doing with the Department of Energy on that matter?

O'KEEFE:

Yes, sir. Thank you very much. There is a direct relationship on all three of the initiatives you talked about. It's a very important focus because, frankly, most folks look at this and consider them all stand-alone issues. And they really are an interrelated set.

Prometheus -- exactly as you characterized it -- is the first big breakthrough that we've really got to concentrate on here, to get ourselves out of the requirement for extraordinary mass requirements to go anywhere. By using chemical propulsion capabilities or what is an interesting twist on the view of chemical dependency, is the requirement for a lot of mass, a lot of material, a lot of volume to get anywhere in order to sustain activities for an extended period of time.

And in the process of doing so, it requires extended duration. It slows you down. It's all the things that would go along with it that are engineering kinds of challenges that make it nigh impossible to get anywhere without an extraordinary investment of time, energy and everything else.

Prometheus is an opportunity to look at a known, given technology that exits today, develop it specifically for employment for not only capacity, to increase speed and on-orbit time anywhere, exactly as you suggested. Avoid the fly-bys and the usual things we've kind of restricted ourselves to.

But one other aspect to it that is positively profound is for unmanned capabilities, all of our current spacecraft are designed so that the maximum requirement that they would yield from power generation requirements is the equivalent of a lot less than the lights in this room, two 60 watt light bulbs. The entire science package has to draw not more than that in order to sustain itself for the entire period of the mission itself.

This will provide a capability at least 100 times greater than that. The scientists are sitting back saying, "We've never even thought about something that would then give us the opportunity to use that much power capacity for something that will revolutionize not only the power generation and propulsion capabilities, but also the science and research yield that have heretofore been unfathomable.

Folks haven't even dared to think about that. So speed, as well as capacity.

Its other relationship is exactly as you suggested as well, that of human endurance. If you can cut down the time to get somewhere, your likelihood of surviving the experience is dramatically higher. Instead of taking a two-year round trip to Mars, for example, which is roughly the period of time it would take to get there, set up, actually make it worth the time to have been there and come back, we're talking about a period that would not exceed the maximum time that we've spent in permanent condition in microgravity, which is six to eight months for a round-trip endeavor.

We've done that. We've survived that experience. We know how to work our way through that. And we need to continue to research:

exactly how do you mitigate against the human effects challenges of something like that?

And lastly, as to the relationship to the workforce, you've hit the nail exactly on the head. There is no way to go out and do these things unless we have the opportunity to recruit and retain the kind of talent in the technical community for engineering, scientific and technology pursuits unless there are the tools to go forward and do that.

Last year, last June, the president submitted a comprehensive list of legislative proposals to specifically target our means to recruit, retain and look for mid-level entry of folks in the engineering, scientific and technology fields. That particular legislation has now been picked up by Congressman Sherry Boehlert's initiatives to introduce that effort, on the other side by Senator Voinovich. And we are anxious to see movement on that front.

There is no question the retirement rates that we see coming and the average age of the workforce right now mitigates against us accomplishing the kinds of objectives that I defined a moment ago, unless those capabilities are constantly infused and brought to bear and indeed, the extraordinary challenge, as well as attractiveness of those kinds of scientific and engineering pursuits are what have folks lining up at our door, anxious to be involved, if only we can develop the tools to actually make that possible.

So the Congress' early consideration and enactment of those proposals would be enormously helpful. And we would ask your support of that effort as well.

KNOLLENBERG:

My time has run out.

WALSH:

It has.

KNOLLENBERG:

But I just wondered, is any of this work being performed in NASA now, relative to what we've talked about? Or is it being contracted out?

O'KEEFE:

A combination of both. Our current efforts . . .

WALSH:

Can you keep the response brief, Sean?

Joe, you really are over time.

O'KEEFE:

Okay. Yes, sir. And I apologize. Indeed, we have worked with the Department of Energy, recruited a number of folks with DOE as well as naval reactor experience, to come in and manage the program at NASA. But a lot of it is being solicited now through universities, as well as contract endeavors.

So we are proceeding down that road. But I thank you for your interest, sir.

WALSH:

Mr. Bishop?

BISHOP:

And welcome, Mr. O'Keefe and to all of your associates. I do support very much the efforts of NASA. And I certainly want to continue the space program.

But I'm more interested at the moment and I'd like to spend my time today talking about some things that are more helpful on the home

front. There are some proposed changes in your technology commercialization activities. I think in your '04 budget justification, you propose phasing out the current commercial technology program in favor of an innovative technology transfer partnership scheme, including a new enterprise engine initiative.

The emphasis of the current commercial technology program has been to effectively transfer NASA-developed technologies through the NASA commercial technology network. Since it began, NASA has fostered and promoted technology transfer and commercialization within the public-private sector as a core mission. And through the technology transfer and commercialization program, it makes NASA's investments in technology more broadly beneficial to the taxpayer.

Now we welcome proven innovative approaches for leveraging industrial and entrepreneurial resources. But I am very, very concerned that your proposal would eliminate funding for the six regional technology transfer centers, the technology assessment commercialization contract partner, which is the Research Triangle Institute, and the commercial technology offices at the 10 NASA laboratories.

These entities provide invaluable industry knowledge, market-based insight, local interactions with companies and academia, resources essential to delivering technology partnerships that yield benefits to NASA, industry and the American public. This is of real concern to me because the contributions to small businesses and small companies, the contributions that they can make utilizing this technology which is transferred, it seems to me, will help the American system, our businesses, particularly our small businesses, be more able to compete in the global marketplace and to keep our technological edge.

For example, I think it was March 26th, the FBI and law enforcement officers were able to get the help of two NASA

scientists, Paul Meyer and David Hathaway, to get help. They normally study sudden storms.

But they used their expertise for analyzing satellite video and created a crime fighting software tool called VISAR. And that's short for Video Image Stabilization and Registration.

And it has the capacity to transform dark, jittery images that are captured by security systems and video cameras in police cars into clear, stable images that can reveal clues about crimes. And of course, this technology has been used and was used very recently to apprehend some criminals in a kidnapping in, I think, Oregon and a couple of other murders.

It's also being developed by Hathaway and Meyer, in conjunction with the Casey Eye Institute and the Oregon Health Sciences University in Portland, to study diseases of the eye and cell movements. And it also can be used to steady the focus of even home videos.

And these technologies are now ready for transfer into the private sector. And areas like mine and rural areas, for example, that utilize these technologies and have businesses that can develop products that can be commercially marketed across the world, it seems to me, particularly in this time of our shaky economy, that we could utilize this.

And it seems like you are now going to reverse that effort and you're going to dismantle the mechanism by which this technology is transferred all across the country by trying to localize it into one regional center that will not be capable, it seems to me, of reaching out and discovering the local and regional small businesses that would be able to enhance this technology transfer and help Americans be successful entrepreneurially abroad.

Can you comment on that? I'm very opposed to that. And I'm interested in continuing that program and will probably pursue some

report language in our bill to instruct the agency not to dismantle, but to continue that program, and to propose expanding it in '05.

O'KEEFE:

Yes, sir. I think we are in absolute agreement on the objective. Technology transfer is a valuable public responsibility in cases in which we have, as a public, invested and made investments in technology and research development efforts that have gone on and to make that as transferable as we possibly can within the commercial enterprise.

Yes, sir?

BISHOP:

Pardon me for interrupting you. I would like to know whether or not, in your decision to do that, as part of your answer, there were any studies done that would reveal to you what the positive or negative, particularly the negative impact, of phasing out this commercial transfer program would be across the country?

O'KEEFE:

Yes, sir. Again, we are in full agreement on the objective. It's a matter of how you go about doing it. And our responsibility, I think, as a public agency, is to protect the intellectual property by the manner in which it's been developed on the part of the public, export controls and ensure that those are enforced, and to make this as readily available to the public as we can.

We have typically seen -- and the studies that would support this are extensive -- that the public typically has been less capable in identifying where the technology applications ought to be. And the commercial enterprises are far better at determining those than the public is.

So our focus is trying to make that information as broadly understood as possible, have it developed into each and every program, to think about where are the commercial opportunities to make the information available, rather than to try to seek out the markets that would be involved. And that's the area that we really are looking to move away from, if you will, of trying to be market forecasters.

The public sector has been not nearly as proficient at that as has a private concern. And so as a consequence, our obligation ought to be more focused in the direction of: how do we get that information and technology and its understanding as broadly available to as many competitors, as many innovators, as many entrepreneurs as we can?

BISHOP:

It seems like you're doing the opposite. You're going in the opposite direction. It seems like the regional transfer centers make that information -- it breaks it down from the technical aspects and makes the small businesses in the regional areas in Podunk, Georgia that may be interested, they have a liaison now that can actually tell them how they can utilize the technology.

They have somebody they can go to in their area that can tell them how they can utilize this technology and what's out there that they can actually develop and market. I mean, this company in Huntsville, Alabama, for example, that is using this technology. It's a great, great boost for them.

They happen to be right next to the Marshall Space Center. But having regional centers all across the country -- six of them -- as opposed to one, which is what you propose, in Virginia, it seems like you're going to move it further away from the capacity of small businesses to be able to do this kind of thing and to really make it more broadly applicable. Doing just the opposite.

O'KEEFE:

Again, sir, it's a matter of how you go about managing a program and making it available. And there's a difference of view here. I fully appreciate that.

But the objective is exactly the same, which is: how do you make the information as broadly available? And right now, our focus is more towards trying to market diagnostic and making technologies we think are better available for certain market opportunities than others.

There are so many folks, if we make the information more broadly available and start thinking about it in the context of the technology focus, that in turn makes it more broadly accessible. And therefore, you get entrepreneurs who are thinking about how to apply it, rather than folks who are trying to figure out how to be market experts.

BISHOP:

But this is a drop . . .

WALSH:

The gentleman's time has expired.

BISHOP:

One comment. This is a drop in the bucket compared to your total budget. You're talking about $35 million.

O'KEEFE:

Yes, sir.

BISHOP:

And only $7 million for the technology transfer centers. That seems to me to be penny wise and pound foolish.

O'KEEFE:

Yes, sir. I appreciate the difference of view. And I fully understand where you are coming from on the issue. And again, our effort is to, quite honestly, lay it out in a more broadly accessible basis. But I fully understand your difference of opinion on it.

Thank you, sir.

WALSH:

Ms. Northup?

NORTHUP:

Yes, thank you. I'd like to ask you about technology transfer too, but on the front end. You know, obviously, companies across the country are pursuing breakthroughs that would help NASA, that would expand maybe the technology. And I just sort of wondered what sort of relationship, what sort of organizational structure do you have to help push the cutting edge, both in the private sector and the public sector, so that our space program can benefit from maybe breakthroughs that predate where the NASA engineers go?

I know that you have contractors. But I am more interested in individual investigators, schools, others that, on their own, are pursuing breakthroughs that might eventually help NASA?

O'KEEFE:

Thank you for the question. This is exactly the opposite kind of a position that Congressman Bishop and I were just dialoguing on here.

The focus of our discussion was more on spin-offs.

NORTHUP:

Right.

O'KEEFE:

Can we make things more available? And what you are focusing on that we are really, really concentrating on now, by what we're calling the enterprise engine approach that we've taken to this, is: how do we get spin-in technologies?

Rather than having NASA engineers and technologists be the sole purveyors, if you will, of trying to develop technology solutions, what we're really seeking to do is: how do we have program managers, engineering teams, scientific groups within the NASA establishment and community, thinking of, "How do I find a technology solution to this specific problem?" and then go seek that technology by using this enterprise engine approach to bring it in and to find those breakthrough technologies that are necessary?

That's part of -- and it's very global. And it's exactly what Mr. Knollenberg and I were talking about, with the Project Prometheus focus, is really trying to tackle that issue of how do you generate power and propulsion, first time ever, is something that is a technology solution that if we tried to do it in-house exclusively, we'd never get there.

But trying to find opportunities to spin-in that technology and find those technology solutions to what have been really persistent kinds of limitations that we've had to deal with, is more our focus at this juncture. So using the enterprise engine approach and bringing that in is the concentration we are adept at identifying what we think are limitations and problems.

NORTHUP:

Is there a culture within NASA that is open to sharing, to both sharing what the challenges are, what the opportunities are, as

opposed to a competition with the private sector? I don't know whether my question is exactly clear.

But is it very guarded? We want to be the first to do this. Or is there a culture that's open enough to say, "Look, these are the dilemmas we have. These are the breakthroughs we could use." And sort of invite everybody in to participate in the solution.

O'KEEFE:

Well, speaking from my vast experience of 15 months, it is more anecdotal and it's more impression, in terms of whether, I think, the receptivity is high on this point. And my personal view is that I think it is, if framed properly.

The thing I find -- the aspect, characterization I find -- most fascinating of looking at the professional workforce capabilities across this really remarkable agency is the interchange that goes on regularly between universities, think tanks, scientific research institutes, companies. It's very free flowing.

And when you go to each center, of the 10 that are out there, it is very hard to distinguish oftentimes who are the folks who are U.S. government public service NASA employees versus those who are engaged in other activities in support of what we do. There is a very, very close community involvement there. And there really isn't a barrier to that kind of intellectual exchange of information.

What there is frequently is a competition between and among programs, which we're trying to break down and really establish more of a promotion of the notion that the technology solution is what we're after, rather than the program accomplishment. And in so many ways, this enterprise engine approach is exactly characterized by the philosophy you've described, is: how do you encourage an atmosphere of bringing in the technology to beat the technical limitations that we continue to just live with?

NORTHUP:

Right. Let me ask you one other question, and that is about the culture within NASA. The reports are so interesting about individual engineers that were concerned between the day of the launch and the day of the tragedy and the unsent emails. Did they decide on their own not to send those emails? Is there an open opportunity to say, "I'm still concerned about this?"

Or did they decide on their own that they -- you know, did they decide on their own not to send them? Or did they feel the pressure not to create a concern? Everybody, you know, to sort of keep the discussion, saying, "We're okay. There isn't a problem here."

O'KEEFE:

Thank you. It is an aspect that I've really, really soul searched a lot about in the last couple of months, looking at the traffic and email information and exchange that goes on.

And there's two things that I found particularly revealing about it. The first one is that it truly is a case where, in this information age, we have established electronic egalitarianism, all right? I mean, when you look at the wiring diagrams and the hierarchies of centers and the agency, et cetera, there is an exchange between folks at all levels of this organization.

There is -- and if you had had a meeting, it would have required only the folks who were division directors, or only the chief engineer or only the chief scientist would show up. In this case, this is a dialogue back and forth between folks who were at lots of different levels and organizational positions within the agency.

It completely breaks down all the usual wiring diagrams. And the expression of statement that's in the traffic that we saw is something that frankly I find gratifying.

It is a very clear statement of, "There is a concern." And most importantly, at the conclusion of all those exchanges, there is resolution. There is a determination at the end that all the folks, as egalitarian as it is, at lots of different levels in the agency, having made a decision that, based on the body of evidence, they were satisfied that the safety of flight considerations had been reviewed and were satisfactory.

Now that's a judgment call. And that's a judgment call that we'll look back on for the rest of our lives as to whether that was the right one or not. And we will review this endlessly, I'm sure. But it was not for a lack of exchange between and among folks who clearly cared about it a lot and really, I think, did some prayerful consideration over what the consequences would be.

And in the end, if they made the wrong judgment, that's a human frailty we all live with and we will have to work our way through. But it was not for lack of exchange in that particular case.

So I'm gratified to see what I think is a culture of openness. And we're going to do everything we possibly can to maintain it that way or enhance it.

WALSH:

The gentlelady's time has expired.

NORTHUP:

Thank you, Mr. Chairman.

O'KEEFE:

Thank you very much for the question.

WALSH:

Ms. Kaptur?

KAPTUR:

Thank you, Mr. Chairman.

Welcome, Mr. O'Keefe. And to you and to your colleagues and to the families that are still in deep grief, obviously people of my home community and all of American stand with you and stand with them.

O'KEEFE:

Thank you very much.

KAPTUR:

Thank you for your service to our country in the cause of science and space exploration. I, in the brief time allowed to me, wanted to ask you a question about the work that you are doing on Earth-Sun science. And I am particularly interested in the question of energy and the applications of your research to needs here on Earth as well.

And I know that in the space science arena, you have an incredible amount of experience, including on the nuclear side. And I believe that you are preeminent in terms of the fuel cell research in this country. I believe that the facility in Cleveland, Ohio -- NASA Glen Lewis -- is the preeminent site for that research within NASA.

As you know, the president, in his state of the union, proposed a $1.2 billion research effort for America to lead the world in clean hydrogen-powered automobiles. And I know that you, as an agency, coordinate with the Department of Energy on some of your nuclear efforts.

I'm wondering if you could tell us a little bit this morning in terms of: your mission to understanding and protecting the home planet; the range of your research that relates to energy systems and how it might be applied to some of our incredible needs here on Earth, starting with your Earth-Sun research, particularly the applications

of solar and photovoltaic research; also, the fuel cell research that you have been doing; and finally, nuclear, which you have already referenced in your testimony.

The second question I have -- and I'll just wait for answers on both -- has to do with what measures we have as a world of perhaps ozone damage and any pollution resulting from our space probes that cuts through the thin veil of light of surrounds the globe. And to what extent do we have information on that?

I've been asked questions about it in my own region. And I don't have any answers. And some of the space garbage that we're leaving up there.

So in terms of the applications and possible future funding that could help to apply what you know about Earth-Sun and fuel cell research to ongoing energy needs here on Earth, and then the issue of the space and our environment and how we protect that very thin layer around Earth.

O'KEEFE:

Yes, ma'am. Thank you very much.

First, on the Sun-Earth theme approach that we have devised, we have dedicated $770 million in this request to the kinds of applications that would cover not only the energy and specific fuel cell-type research efforts that you talked about, but also a range of capabilities that we're looking for solar dynamic observatories, a range of other opportunities in the Earth science applications area. So there is a very concentrated effort on this Sun-Earth theme that you referred to as part of our Earth science application area.

KAPTUR:

How long have you had that?

O'KEEFE:

I want to say this is the second or third year that we're pursuing it.

KAPTUR:

It's fairly new.

O'KEEFE:

Yes, ma'am. Exactly. And we've tried to pull that together as more of a concentrated effort. But let me get you a more precise . . .

KAPTUR:

May I just tell you, I represent the glass center of the world, the photovoltaic center of the world. So we're very interested in connections to what you're doing there and an understanding of where you are headed.

O'KEEFE:

I appreciate that very much. And indeed, the Glen Research Center is doing some remarkable things in the power generation kind of arena, looking at fuel cells and a range of other applications, as well as participation in this Project Prometheus effort. It has really become a very important center for the purpose of looking at power generation capabilities and to examine a wide range of applications in other areas.

As it pertains to the Earth science focus for the environment, I would say that the primary contribution we make is in the president's climate change research initiative arena. Half of the assets that are used for that particular focus will be derived from NASA's capabilities. And we are very much in concert, working with our colleagues at NOAA, at the Commerce Department, to assure that we coordinate those assets very carefully.

One of the biggest individual, I think, aspects of our effort in that regard is -- begun the better part of three years ago and is

beginning to deliver at this time -- is the national polar orbiting operational environmental satellite system, which is a replacement of all the capacities for a coordinated capability between us, the Air Force, NOAA and other agencies, National Weather Service, for the purpose of really getting a better, more comprehensive understanding of the environmental consequences of our habits. And that's part of the president's focus of trying to look at what are enforceable mechanisms for trying to change behavior as it pertains to climate change effect, but also to understand the environmental consequences and much of what we do in a much more timely way.

And the coordination among all the various agencies, throughout this national observing system that we're using now, is certainly going to give us a leg up in that direction. But that's the primary focus of what we're after at this time.

WALSH:

The gentlelady's time has expired.

KAPTUR:

Mr. Chairman, could I just ask the doctor if he could arrange to have someone come up and see me privately on the Earth-Sun effort?

O'KEEFE:

Absolutely.

KAPTUR:

So I can get a better understanding of what you're doing? And then also, to ask for a question for the record relating to the impact of NASA's space shots through the atmosphere and how you're measuring the impact of that on the oxygen layer?

O'KEEFE:

Yes, ma'am. Would be delighted to make sure the folks are available to give you a full briefing on the Sun-Earth theme and the focus e taking there, as well as provide information for the record on this question as well. Thank you.

WALSH:

Mr. Aderholt?

ADERHOLT:

Thank you.

O'KEEFE:

How are you, sir?

ADERHOLT:

Director, it's good to be with you today. And thank you for being here. First of all, let me say that we do appreciate your support of the inclusion in the budget request for the orbital space plane and also the next generation launch technology program.

Certainly, without these programs, there would be significant gaps in our ability to meet near-term needs and also efforts to meet future launch needs. And we look forward to the progress made on these two programs.

As you know, some of the work is done there at Marshall in north Alabama. And certainly, that's important to us. But what you may or may not know is that I know represent part of the Huntsville-Decatur area. And so even though it has been important to north Alabama and my district, now it's even more important than ever. So we thank you for your support.

I understand that China plans some human space flight in the near future. And they have been very aggressive on that, with a launch planned in the near future.

Just wanted to get your thoughts and your insight regarding the progress in the human space flight in China, what you understand may be going on over there, if you know anything that's occurring.

O'KEEFE:

Certainly they have -- their public statements and actions would suggest that there is a national commitment towards a space exploration capability in the People's Republic. How dedicated they are to that over time and how soon we may see that manifest is speculative. But it appears to be increasing, no question about it.

In terms of what the motivations are or objectives, I would certainly defer to my colleagues at the State Department and elsewhere to make a more reasoned judgment about what it is they are after. But as it pertains to what we are engaged in, it is pretty clear. There is an interest and focus in the space exploration objectives that have not been evidenced there before.

ADERHOLT:

Thank you. I have some questions, Mr. Chairman. And if you have time, I've got a couple, but I'll just submit them for the record.

WALSH:

Thank you very much.

Mr. LaHood?

LAHOOD:

Thank you for coming today. I had the privilege of attending the memorial service in Houston and was struck by what a family the NASA community is.

I really went there because of an astronaut by the name of Scott Altman, who is from very near my hometown of Peoria. He's from Pekin. And I was just with Scott about a week or so ago.

He's an outstanding astronaut and has been the commander of three missions. And he is a fine, fine fellow. And I know that you are proud of him. And I'm proud to say that he's a constituent.

His parents are both former teachers, each of them teaching over 35 years in the Pekin school system and really, really an outstanding family. And I had a chance to visit with Scott when I was there that day and then had a chance to see him just recently, where he gave a speech in Eureka, Illinois at Eureka College.

So I know you're proud of him. And you should be. I'm proud of him too.

Can you explain, I think, really for all of us, why it's so important to continue with manned space missions? I mean, can't we learn as much? I think the question is: can't we learn as much from the unmanned missions as we can from the manned missions?

And the risk that's endured by the people who we've lost, is it mitigated against what we really learn? I guess that's the $64 question.

O'KEEFE:

Yes, sir. This is the exact focus of the dialogue that Mr. Price and I engaged in a little bit earlier. And it's exactly the right kind of concern and balance that needs to be attended to.

And interestingly, your reference of Scott Altman is exactly a propos to this response as well. Scott was the commander of the last

successful Columbia mission, a remarkable aviator, an outstanding astronaut -- one terrific fellow, no question about it.

And the last I saw him, as well, a few days back, I complimented him on his talk at the Eureka College. I saw coverage of it. And it really was -- it really captured the sentiment of so many of us around the agency very, very well. He really is a very articulate, very thoughtful guy.

That is an example of the kind of mission that really does require human intervention, is the one he commanded to Hubble just a year ago. And there is no way we can do a remote kind of adjustment, whatever, of some assets. Sometimes, it really does require the unique characteristics, capabilities, skills that only human beings can bring to the occasion.

Or we resign ourselves to the fact that we're going to have to have multiple missions. And each time there is a failure of an unmanned space probe, that we are prepared to just go launch another and go think about what that will take repetitively to be able to adjust.

So striking that balance of where we incur and why we should avoid human risk as often as we possibly can, but recognizing that there are just some aspects of this that simply would not be possible; the construction of the International Space Station being a classic example. No way that you could have launched that capability.

It's the size of two football fields. And there's no way we could possibly launch that capability and put it into that laboratory condition and have it operational without the skill and unique talents that people bring to the occasion. And we're trying to figure out how to minimize that to the absolute bare minimum of what it is that would expose the risk to individuals, but at the same time, recognize that only those human characteristics sometimes are possible to make these capabilities a reality at all.

So constantly, that's a soul search we go through regularly to try to determine what that balance should be.

LAHOOD:

When will the American people and the NASA family know the final report? When will the final report and the final recommendations and conclusions and all of the aspects of that, when will that be ready?

O'KEEFE:

Well, the independent -- and they are independent -- Columbia Accident Investigation Board is moving apace. And all indications, all signs would suggest in the coming weeks and short, single-digit months from now, we should have a pretty good read of exactly what were the cause or probable causes of the accident.

But I would defer immediately to Admiral Hal Gehman, the chairman of that board for a more precise answer because the last thing I want to do is motivate them to wrap up their activities before it's done. And we don't want the report so badly that we get it bad.

LAHOOD:

How soon after the report is issued will NASA entertain another manned mission?

O'KEEFE:

We are starting right now to look at what it will take to return to flight as expeditiously and as safely as we know how to do it. And Admiral Gehman and the board have been very forthcoming in their public testimony and their statements about the kinds of things they see as being hardware deficiencies, process concerns, whatever, that have given us some very strong signals of the kinds of things we can go about right now, beginning to make changes to, to prepare

ourselves as quickly as possible to return to flight safely as we possibly can.

So my fondest expectation would be that if there are no showstoppers on the hardware side, there is no process concerns that should take a tremendous amount of time. But if there are no showstoppers on the hardware end, the opportunity to return to flight as early this year, by the end of this calendar year as possible, would be our goal.

Beyond that, though, we are prepared for the fact that this may take longer than that. But we're preparing to do this as soon as we can, once we've got the full understanding of the board's findings and their recommendations on how we may proceed ahead. That is our expectation.

LAHOOD:

As other work that I do, I know that the NTSB performed admirably immediately afterwards. It did cost the agency about $3 million. And they approached me about the idea of when they might be paid.

And knowing that I was going to be with you today, I wonder if you could have someone on your staff check that out. They are -- you know the work that they did. And they do great work. And it did cost the agency about $3 million. If somebody could check that out?

Thank you for the work that you and the entire NASA family do.

O'KEEFE:

Yes, sir. Thank you very much. Appreciate it.

WALSH:

Thank you, Ray.

Dr. Weldon?

WELDON:

Thank you, Mr. Chairman.

Mr. O'Keefe, it's great to have you here. I want to congratulate you, along with the chairman, on Syracuse winning the Final Four. And I want to commend you for the leadership you have provided NASA and all the men and women who work there in the days and weeks following Columbia.

I also want to commend you for getting the space station budget under control. It's amazing. That was the big topic of discussion four or five years ago.

And it just got very quickly breezed over in your opening comments. But that was, I know, a lot of heavy lifting for you and a lot of your staff. And I think it will serve you well -- certainly, if you are able to stay within that envelope you say that you're in right now.

I also want to commend the president. I've been in the Congress now nine years. And these are the best five-year outyear numbers I've seen for the agency in the whole time I've been in the Congress.

You're looking at, you know, about an average of a three, 3.5 percent growth rate for NASA and growing it to $17.8 billion over the next five years, which I think speaks very well of a commitment on the part of the administration to advancing both human space flight, but as well the aeronautic research side and the unmanned probes.

I have a question for you about the orbital space plane. And I really have two questions there.

One is you talked about flexible launch. As I understand it, the concepts you are looking at are launching the orbital space plane on an EELV or Delta-type or Atlas version EELV. How do plan on addressing making those launch vehicles flexible?

And then the other question I have is: somebody within NASA was quoted as saying that we cannot accelerate OSP and that it wouldn't be able to come on-line until 2012 or sometime, 2015. And I thought that statement was a rather curious one when I read it in the press, considering that we went through Mercury, Gemini, Apollo, put a man on the moon in about nine years. What are the issues surrounding OSP that make it impossible to accelerate that program?

I'm interested in accelerating it obviously because I don't like the situation we're in any more than anybody else on this committee. We're dependent upon the Russians for crew return and crew exchange at this time, with the shuttle being down. So I'm very interested to hear your response to my questions.

O'KEEFE:

Yes, sir. And thank you very much. And first and foremost, thank you for your observations on our efforts with International Space Station.

It is, I guess, symptomatic of the last couple of months, I find that each day is the equivalent of a year. And it was just a year ago that this was the primary concern that we were focused on and really attended to.

And we have done everything I know how and everything the program management team can possibly have focused on to really develop some engineering and systems integration discipline, as well as cost and schedule discipline, in a way that, as soon as we can return to safe flight, I think you will see an expeditious completion of the core configuration of International Space Station and, as rapidly as we can as partners, develop that research and laboratory condition to as impressive a capacity as all of us dreamed in the original case. So I think we are within reach of achieving a goal that frankly has been elusive for many years. So I think we're right on that cusp.

As it pertains to the orbital space plane, thank you for your questions. I share your skepticism that we are incapable of accelerating it. I think we are.

And indeed, we have asked folks associated with the activity and the program management team to go back and look at all the options necessary in order to move and accelerate this forward. Because it really is a very select number of capabilities we seek to incorporate into the orbital space plane.

This is a sharp contrast to prior philosophy, I guess, which was to try to conquer a whole range of different capabilities, suspend laws of physics, do all kinds of things, in order to see a replacement to shuttle in all of its capability entirety. Instead, our focus this time is to say, "No, our first mission responsibility is how do we expeditiously get a crew transfer capability to the International Space Station that brings people, makes sure the expedition crews are rotated as often as necessary, and that has a minimum capacity for logistics support necessary."

There are a number of other capabilities we have devised in order to meet all the other logistics requirements, cargo lift, using shuttle for heavy lift capacity for as long as necessary, but to reduce the crew size potentially on shuttle, so that you use it as primarily a heavy lift cargo capability. So the characteristics we seek to incorporate into orbital space plane that I think are most advantageous, in addition to the mission responsibility to go into International Space Station and a rapid turnaround capability, are two characteristics that have bedeviled us on shuttle: maneuverability, of which there is literally no more than one degree of separation right now that we can muster by the propulsion jets that are aboard station for maneuverability.

So it restricts you to exactly what the launch windows will be. And if you miss that launch window, you might as well forget launching because you can't maneuver the asset within rendezvous range in any period of time that would be considered reasonable.

So the maneuverability characteristic, one that has a capacity in order to meet those kind of rendezvous necessary, is going to really provide a capability that would let us, not necessarily launch on demand, but come closer to it than we certainly can now. The build up time for shuttle is a 30-day rollout. Then you've got to meet that 10-minute window in order to meet the launch rendezvous orbital mechanics requirements of rendezvousing with any asset; station, in this particular case, being the prominent one.

So trying to meet that technical limitation, provide some flexibility of launch capability, do something that would make this asset more versatile for that purpose, will then demonstrate that technology, which then can be applied to the next generation capability beyond it. So we're trying to beat the technical challenges one or two at a time, as opposed to trying to conquer them all in one major program.

In terms of acceleration of the effort, again, we're looking at all of the efforts that would be possible to make that available as soon as we possibly can. And we're examining that right now. So as soon as those results of those endeavors are available -- I'm skeptical too that there is a limitation on that front.

WALSH:

The gentleman's time has expired.

Mr. Simpson?

SIMPSON:

Thank you, Mr. Chairman.

And thank you, Mr. O'Keefe, for being here today and for your testimony. I appreciate it very much.

Let me say, first of all, I have talked with several of the firefighters and volunteers that have been down and helping look for the debris

and so forth. And I want you to know that they tell me how much it means to them, in their base camps and so forth, that the astronauts actually come in and talk to them about the NASA program and what it means and what space flight is all about. And it inspires them very much and keeps them going for the long days that they're out there searching the ground. And they do appreciate that very much.

O'KEEFE:

Yes, sir.

SIMPSON:

One of the things, we've talked about it several times here today, is this Project Prometheus. And as Ms. Kaptur is from the center of the glass world, I guess I'm kind of from the center of the nuclear world, in that the INEEL is located in my district.

We have talked about what that is. Where are we on that project? And I suspect you are working with the Department of Energy and with the Nuclear Fuels Program, the Navy Nuclear Fuels Program, on that. What's the cooperation going on there? And where exactly are we on that project?

O'KEEFE:

We're moving ahead very, very expeditiously. And the effort that, again, Congress endorsed as part of the 2003 budget proposal last year and just enacted here in February gets us well on the path right now to get started on developing a propulsion and generation capability and beginning the task of designing a nuclear reactor that would have that capability in hand within this decade, is our objective.

But also, in working with our friends at the Department of Energy on the civil side for all the certification necessary in order to do this by the rules and do it properly, to assure that we have the certification

efforts necessary that we have to go through, through DOE, but also design prowess that the naval reactors community brings to it. They have got an unblemished record of 125 million miles of safe operations of nuclear reactors on this planet and have done it in a way that is really quite -- we need a fraction of the energy that they know how to generate.

And so trying to enlist their interest -- and there is a strong interest on their part -- in participating with us. And we're getting very close to working through the administrative details, management issues necessary to bring their design and management prowess for the reactor component of this particular approach to being as quickly as we can.

Finally, we seek to demonstrate the technology and actually go out and demonstrate how we can get there faster and have on-orbit, multiple paths capabilities and maneuverability that currently is not possible, within the timespan that we're looking at developing this capability, this decade, and a Jupiter mission that would demonstrate that technology here, launched and started by the end of the decade, is our objective.

So we're heading down that road and doing it as quickly, but as safely, as we know how to, in cooperation with all the folks that we need to have in order to make this a reality.

SIMPSON:

I appreciate that. And I suspect much of that work will be done at the INEEL with the Navy Nuclear Fuels Program and the DOE. The work that the Navy Nuclear Fuels Program out there has done has been incredible.

In fact, most people don't realize that when they fueled the first Navy submarine, I think the fuel lasted something like a year, less than that, or something like that, before they had to refuel that ship. And now, with the improvements they have made in nuclear fuels,

the next aircraft carrier will be fueled when it is commissioned and unfueled when it is decommissioned, a 50-year lifespan of the fuel.

So they have done an incredible amount of work out there that could be very promising for NASA in their long-term goals.

Let me also say that I certainly appreciate the educational outreach that NASA does with the youth of this country, both in designing some of the experiments that are done in their programs and so forth, but also engaging the high school youth of this country. And Barbara Morgan, as you know, from Idaho has done a tremendous job.

She has been a great ambassador for NASA. We hope that one day, she'll actually get up into space and stuff. But she really has been truly an asset.

As sort of a general question, you know, in the '60s, one of the things that really promoted NASA and I guess if you want to call it the boom years of NASA, was when President Kennedy really put forth the challenge that we would land a man on the moon by the end of the century. I think the American people need that kind of challenge, that kind of mind-altering challenge, that President Kennedy put out at that time.

While we do many very important things at NASA, many very important projects, what is the -- you want to say -- mind-altering program or challenge that we could put out there or that you would put out there that would capture the imagination of the American public? Because I think it needs that to bring that continued support for NASA.

O'KEEFE:

Yes, sir. I appreciate it.

First, let me comment on a couple of your other observations here. The naval reactors' presence within NASA nowadays is beginning

to look like a chapter of the alumni club, okay, from the naval reactors community. The chief engineer, Theron Bradley, of course, came from the Idaho Falls facility, and is a just stand-up, outstanding chief engineer and has done a great, great job for us and indeed, has helped us look at how do we forge those kind of relationships with the Department of Energy and naval reactors community to accomplish this objective and do it right.

And a number of folks who are running the Project Prometheus effort are all pedigreed from the naval reactors community. And that's exactly the kind of safety obsession we want to see brought into this particular project to make e it's done right and done as expertly as we possibly can.

On the education outreach efforts, no question, Barbara Morgan has been singularly one of the most extraordinary, capable individuals at really demonstrating that education outreach effort. She will fly on STS-118, as soon as we get back to flight.

That's her slated flight schedule. And our intent is to start the clock as soon as we get back to safe flight. And she will see that within months after resumption of flight.

As it pertains to big goals, this is a really bedeviling question. And it's one that really, I think, in trying to establish a big goal and a vision of what it is we ought to do as Americans for exploration objectives, there are any number of destinations that folks will define as being appropriate big goals and no consensus on which of those there ought to be.

But the stark reality is -- and the one consensus position is -- we do not have the means or wherewithal to accomplish and actually get to any of those destinations at present. And so the whole focus of what we're trying to put together -- as pragmatic and unglamorous as it sounds, it nonetheless is very pragmatic in this sense -- is having the enabling technology to actually do any of those big goals when a consensus does emerge as to where we ought to go.

The evidence is mounting that a destination like Mars could yield some extraordinary understanding of not only our origins, but also the evolution of this solar system and what progression, in terms of climate change, a number of different geological characterizations, that may tell us a lot about the condition we're in. It may be worthy, in time, of the objective of going there. And our capacity to actually make it possible is what we're trying to do today.

Project Prometheus, the human research and human endurance kinds of initiatives that we're trying to do in order to make that possibility a reality, in whatever period of time that ultimately gets articulated, is what we're after. Because in the end, it's going to take a convergence of much greater articulation than what any scientific community could bring to bear on what those big goals are. It's going to have to be a larger national consensus of what our imperative is, as Americans, as to why we would want to accomplish some stated objective.

And that's what we need to be prepared to do when that arises.

SIMPSON:

I appreciate that.

WALSH:

The gentleman's time has expired.

SIMPSON:

And I do appreciate the fact that we don't have the wherewithal to do some of those things. But also, when President Kennedy made his announcement, we didn't know how we were going to get to the moon and whether we were going to be -- how we were going to land somebody there and bring them back.

And I do think that in the long term, big goals are important things for the American imagination.

O'KEEFE:

Absolutely. No question about it. I fully agree with you.

WALSH:

Mr. Goode?

GOODE:

Thank you, Mr. Chairman.

Mr. O'Keefe, appreciate your being here. I just want to say that NASA-Langley works closely with my office and with all in the Virginia delegation. Appreciate the good work of Mr. Freeman (ph) and those there. And we have talked a lot about space.

And part of NASA, second "A" is aeronautics. And we want to make sure that continues to be a primary focus of NASA, along with your other endeavors.

In that connection, I was wondering if you could tell me your vision for the future of the small aircraft transportation system? We believe that that offers great potential for enabling more people to utilize the skies and get to many different places quicker.

O'KEEFE:

Yes, sir. We are very much in support of the effort. In the current budget before you, I think we proposed a little over $30 million to continue that effort. I appreciate the committee's support.

It is a very significant initiative, I think, to make available and accessed the broader range of regional commercial service capabilities. And this is a facilitating mechanism to get there. We're very much in support of that effort.

GOODE:

To jump to another topic, your nuclear systems initiative mission and the Jupiter Icy Moons Orbiter -- and I think Mr. Knollenberg referenced that in an earlier question. Do you -- and there is funding in this budget for that. I take it you are sold -- or not sold in the right word -- you are optimistic in believing that this is a good way to go for deep space exploration. And I'd just like your comments on that.

O'KEEFE:

Yes, sir. This is a technology that is developed. It's proven. We know the risks. And we know folks who know how to manage those risks. Let's get on with it, is basically the bottom line.

From this, I think we'll emerge even better technologies. And by moving in the direction of: let's get out of the basic paradigm we've been in for the better part of 40 years that chemical propulsion is the only way to go. And that requires lots and lots of mass. And it makes the accomplishment of the big goals that we were just talking about with Mr. Simpson very difficult to accomplish even under conventional methods because there just isn't any way to make that work.

This is an opportunity now to rid ourselves of all those limitations. And in the end, I would confidently predict that this may not be the technology ultimately that is employed. It will be something that comes from this that is discovered or developed and understood better because of our intensive review of looking at a different way to crack this nut. And, by using power generation and propulsion capabilities, of known technology origin but different than what we're currently strapped in with, opens the aperture to another whole way of looking at issues. And I think we will find, in very short order, that we're able to rid ourselves of what are some real technical limitations that we've just kind of resigned ourselves to living with for a lot of years.

GOODE:

I know one of the gentlemen asked you about what China's -- what you thought about China's going into the field of manned space flight. If we go forward with this -- and I, like you, think it has tremendous potential -- we would continue to be first and foremost by far. You don't see Russia, China or any of the other nations getting into the nuclear area like we are, in this deep space exploration? Or do you?

O'KEEFE:

It's hard to predict. It does not appear to be the current direction that the People's Republic is moving in. But then again, they are just taking these initial -- and I wouldn't call them tentative steps, but they are certainly very intermediate kinds of positions, to establish a space exploration and potential human exploration objectives.

So yes, we are several factors ahead of where I think any other global focus might be, from the Russians, from the Chinese, from anybody else. And this particular focus, I think, is -- in part because of the opportunities for a reactor capability -- is going to liberate us from all these other limitations we just talked about, but also because I think it's going to open up another whole set of technology opportunities that we really don't fully understand today. They aren't thinking in those directions at all, that I know of.

GOODE:

Thank you, Mr. Chairman.

WALSH:

Thank you.

Mr. Fattah?

FATTAH:

Thank you, Mr. Chairman. Let me just ask you about the reorganization efforts that are taking place. And particularly, I am interested in what the agency's plans are, relative to the minority university research and education program.

O'KEEFE:

Yes, sir. Thank you very much.

We have, during the course of this past year, constituted an education enterprise, a brand new organizational element, having recruited Adena Loston from her capacity as president of San Jacinto College in Houston to come to this opportunity and really focus our attention towards the broader education objectives. And part of that effort is to assure that we make all of our university research centers, fellowships and research programs that are engaged with universities, part of a science- or research-driven enterprise and coordinating those activities.

So she and Dorothy Hayden-Watkins, who is running our equal opportunity objectives, are working very, very closely together at this juncture in order to be sure that there is a seamless transfer there for all the minority university programs, that they are part of a science and research enterprise and continued -- we are looking to enhance, increase the minority outreach efforts in the university research center activities and relationships during the course of this year. And in the budget before you is well over $90 million to accomplish that particular task and make it part of the science and research enterprise, focused through the education outreach efforts that Dr. Loston is pursuing now.

FATTAH:

Let me thank you. And let me ask also about, in general, NASA's activities in terms of trying to take your expertise and have it be usefully applied in terms of K through 12 science curriculums in the country and where there are opportunities for partnerships that you

see for NASA to -- there has been a lot said about the dearth of science education in our K through 12 system and also the lack of native-born Americans pursuing degrees at the doctoral level.

I think there is a correlation between those two things, in that there are clearly schools within miles of your location in which young people are not being afforded high quality science instruction. And that's similarly true across the country.

I would appreciate hearing from you about how it is that you presently interface and what perhaps could be done to do more.

O'KEEFE:

Yes, sir. That's again part of our effort to really concentrate on the education activities throughout the agency in a coordinated way, is what Dr. Loston is bringing to this.

I mean, every one of the 10 centers that we operate throughout the country do a wonderful job in a lot of community efforts in education, focused K through 12 kind of tailored efforts. But this is the first time we have really had a concentrated, agency-wide focus to pick up best practices of how we bring that in to the agency and transport it around to all the centers of how we would concentrate in this area.

It is a very firm conviction -- and, as a matter of fact, all the analysis supports this view -- that if you really don't attract or motivate kids in that grade six through nine timeframe in math/science-related fields, they not likely to go into it. In the course of the last -- in the 15 months I've been with the agency, I have found one person -- one -- who, in college, changed from a liberal arts major to a science, engineering or technology-related field.

Everybody else, we all know from our own experiences, went from engineering or science to liberal arts majors, has changed majors during the course of that time. So if you don't catch these folks -- kids -- in that range of six through nine timeframe, their interest in

pursuing some of these professional opportunities down the road are limited.

And indeed, it's gotten so attenuated in this country that last year, we graduated more folks with degrees in sports and exercise science than we did in electrical engineering. Now that really, I think, demonstrates a real decline -- markedly -- of folks interested in science, technology and engineering-related activities. And we need to do a lot better at focusing on that middle school to early high school kind of education opportunity to really motivate interest in what it is we're engaged in, not just for NASA's benefit, but for the larger national interest, in the aerospace community, as well as a lot of other applications in technology-related fields.

In the process of doing so, it also means we need to be more thoughtful about how we look at our recruiting objectives, specifically to bring folks with those disciplines into the occasion of what we are involved with and to start looking at some of the university research centers and the scholarships, as well as grants and fellowship programs, to establish a linkage back directly so we can recruit folks from those activities. And that's a lot of what this education focus, that Dr. Loston is bringing to it, is concentrating on, is that K through 12 period, to stimulate, motivate and excite kids. And secondly, to look at how we can then more exactly look at recruiting objectives to bring folks into what we are looking at as a burgeoning challenge in the future of bringing in professionals in engineering, science and technology-related fields.

FATTAH:

I guess . . .

WALSH:

The gentleman's time has expired.

FATTAH:

Thank you, Mr. Chairman.

O'KEEFE:

Thank you, congressman, for very thoughtful questions. Appreciate it.

WALSH:

We'll begin a second round. We are scheduled to complete our work at 1:00. So we'll see if we can move this along expeditiously.

O'KEEFE:

Yes, sir.

WALSH:

Do you need to take a break? On March 12, 2003, the associate administrator for space flight established a formal Return to Flight Team to evaluate corrective actions necessary to plan for a -- quote -- "safe return to flight as soon as practical. As a goal, the Space Shuttle Program Office shall support a launch opportunity as early as the fall of 2003."

First, I'd like to know why the fall of 2003 date was selected, when you have yet to receive any information from the Gehman Investigation Board?

O'KEEFE:

Well, we have, in fact, gotten some very strong indicators from the Columbia Accident Investigation Board that, again, there are specific hardware and process failures that needed to be addressed. And so they have not been, you know, I think, circumspect about what they view as being issues there. And they are working their way through the report and the findings and so forth.

But they've been very forthcoming in all their public statements of here is where they see some specific deficiencies. And we get one of two choices. We can either sit back and wait for the whole thing to be stapled together and bound until we then begin our activities and parse through all the findings, or start reading those signals and get on with it now, to figure out what process changes, what hardware improvements do we need to make now to position ourselves as quickly as we can to return to flight?

The fall target or goal is just that. It isn't driven by any superior knowledge of ultimately what may prove to be the limitations.

It's more a case of let's set that as a focus so that we can try to calibrate everything we're doing -- the support of International Space Station, continuing efforts to process everything that is necessary to keep those programs moving -- and look at that target as a potential circumstance. Because the last thing we want to do is get into the opposite condition, where the report comes out and then we start thinking about what it takes to get there.

WALSH:

Along that line, one of the recommendations was a thorough review of the adequacy and robustness of key space shuttle systems, such as the insulation approach currently used in the external tank. This would lead one to assume that you already have concluded that the tank insulation is a significant factor in the safety of the shuttle fleet.

Is this conclusion based solely on the events surrounding the launch of the Columbia shuttle? Or do you have significant store of data, with regard to insulation striking the orbiters in the past, that leads you to conclude that this is a serious issue?

And if that is the case, why hasn't the insulation process been examined in the past for corrective action?

O'KEEFE:

There are a number of design changes to the external tank that have been examined, I am told, over the last couple of years. A number of those are coming to fruition and being parsed out right now to determine what major changes should be made, independent of whether or not it proves to be at the source or at the beginnings or one of the contributing factors or whatever to the accident or not. It is part of the process improvement that we ought to be conducting.

Over the course of the last 20 years, there have been four -- four -- foam strikes. The first one was on STS-07. The next was on 32, 50 and last was on 112. That was the most recent one.

And there have been 10 years between those two events, the last two events. The most recent one again was on STS-112 in October of last year. That was the first time that had occurred in 10 years.

So is there a trend analysis there? Sure. Is it over an extended period of time? Yes.

And looking at the evidence would tell you that we may have satisfied ourselves that the infrequency of that strike -- four times over that span of time -- was enough to satisfy everyone's engineering curiosity that the damage and so forth was not significant or it was determined not to be a safety of flight consideration based on those four events. That's hardly a trend.

And it's one that we really ought to look at more carefully and as a whole range of process and product improvements that we have considered, all the way up to this time, that independent of whether this proves to be the origin of the tragedy or not, ought to be made as design change improvements to avoid any strikes, much less that many over the course of that time.

WALSH:

My last question is another issue that arose in the disaster -- and I know it's been an issue for NASA in the past -- and that's thermal protection. On reentry, the heat that the orbiter has to deal with is a major issue obviously, especially when there is a breach in the outer shell.

In hindsight, do you believe NASA has placed adequate attention on the thermal protection system employed on the shuttle fleet? Or could you have done a better job in finding a solution to the existing thermal protection problem?

O'KEEFE:

Well, clearly something went deadly wrong on February the 1st and caused this horrific tragedy. Whether it was a consequence of the breakdown of the thermal protection system or not is something that we're, again, going to get the findings and the recommendations of the board in pretty short order. I think they're starting to narrow down and angle into where they believe the cause or probable causes were to have emerged in the very short time ahead.

But there is nothing that I'm aware of right now that would point uniquely to the thermal protection system as being deficient in this particular case. It is still important to remember what we're talking about is something that comes -- an asset capability that reenters the atmosphere with thousands of degrees temperature, moving in at speeds in excess of 20 MOC (ph). This is a screaming beast coming through that atmosphere. And any penetration, not matter how, I think, diligent we could be, any penetration is going to motivate a catastrophe like we saw in this case.

So exactly what caused it is the concern. Once the breach is done, it is a case where there is little that we can anticipate of how you could ever make that capability survive that experience as thoroughly as what we would otherwise hope for. We need to find out what the cause was, make the corrections to that thermal protection system to mitigate that risk as much as we can.

WALSH:

Thank you.

O'KEEFE:

Thank you, sir.

WALSH:

Mr. Mollohan?

MOLLOHAN:

Thank you, Mr. Chairman.

Mr. O'Keefe, the shuttle grounding consequences, I know you are considering those. I would like for you to talk a little bit about what are any new or additional costs associated with maintaining the shuttle due to the grounding -- of station due to the grounding of shuttle?

O'KEEFE:

At this juncture, it should not be terribly excessive. Recall that -- and I can't put a number on it right now because it is still evolving. But recall that last June through October, we grounded the fleet as a consequence of identification of a hairline fracture in a fuel line.

And until we really diagnosed that problem and then made corrections to it, there was that almost six month grounding of the fleet that occurred at that time. And the costs attended to that were really not huge at all. It was more a case of satisfying ourselves that the safety regimen that we pursue was reliable.

In this particular case, the biggest consequence that we're currently encountering, that we're making decisions about today, because it's hard to tell how long this fleet will be grounded, is: how do we

support International Space Station properly? And again, as I talked about a little bit at the opening statement, the position we've agreed to, as all of the 16 nations in the partnership, to send up Expedition Seven with two crew aboard because we can adequately support two folks aboard station for nearly an indefinite period of time, given the current logistics and emergency egress capacity, the Soyuz vehicle, to support that crew size for an indefinite period of time.

It would have been a big stretch to have supported three. And so that's the biggest consequence that we're currently encountering.

And along the way, in this interim situation, I am pleased to advise that the partners are acting like partners. They are stepping up to this responsibility. And the additional cost to the U.S. in this particular event is to what it's going to take to return to flight, not the interim solutions that are involved.

MOLLOHAN:

What's going to be the impact on core complete? Time?

O'KEEFE:

Less than cost.

MOLLOHAN:

Do you have an estimate?

O'KEEFE:

If we can get back to flight by the end of this calendar year, we're talking about a delay that probably wouldn't be more than about nine months.

MOLLOHAN:

Is that what you're targeting, getting back to flight by the end of this year?

O'KEEFE:

Yes, sir. We're preparing for the prospect that it could be that early. So whatever time we restart the clock and fly, you can basically take the last schedule for International Space Station, commencing with STS-114, which by the way will be commanded by a Syracuse University graduate, Colonel Eileen Collins. She will be heading forward in that -- so she will be the first return to flight orbiter going up on Atlantis.

And as soon as we can get back to flight, that period of time thereafter to completion of International Space Station for the core configuration is no more than 10 to 11 months.

MOLLOHAN:

In your budget justification, you go beyond core complete, a couple of projects. After core complete of the space station, what are NASA's plans?

O'KEEFE:

The next series of international partner modules that will be ready -- and will easily be ready now -- for deployment will be the European Space Agency's Columbus module, which is a research laboratory, which would go up within, I'd say, nine months -- six to nine months -- after the core configuration is accomplished.

You have to have a node capability there to attach it. And that's what was intended to be as part of STS-120, six flights from now.

The next one after that would be a Japanese module, which is again another laboratory condition that they have devised and is nearing completion, ready for test and check-out. The centrifuge module will be not long after that. There are a variety of other U.S. capabilities

we would look to, to expand our capacity there, potential in the habitation module arena.

And so a whole range of capabilities will continue to be launched past core configuration, which would build out the station, along with the solar arrays, over the course of the roughly two to three years after accomplishment of the task.

MOLLOHAN:

The other question, beyond the core complete and the additional parts that you intend to get up to the station, when do you think that you will get to full capability? When do you think you will get beyond having two people? Be able to produce enough water? Be able to guarantee return?

So that we're really at total capability of the station and doing the scientific work that we have talked about doing, what do we have to do? Do we have to get the space plane done? What do we have to do? And when do you think we will have it done?

O'KEEFE:

Yes, sir. I think, just as a thumbnail sketch of it, it will be roughly two years after completion of core configuration, we could get the balance of all the components up-launched, installed and operating. So we could see . . .

MOLLOHAN:

So you're going to get there before you get space plane done?

O'KEEFE:

I'd say -- well, the potential opportunity would be to have it concurrent with that. If we could accelerate the orbital space plane and make that available as a crew transfer vehicle, use shuttle as primarily the heavy lift cargo capacity of choice, that's the ideal . . .

MOLLOHAN:

Well, you're not planning on having that done, I think, until '08 or . . .

O'KEEFE:

End of the decade. Yeah, end of the decade. So potentially, we accelerate that and make it available sooner than that and install all of the international partner components within two to three years max after completion of core.

MOLLOHAN:

But that's the accomplishment that has to be . . .

O'KEEFE:

That would be great.

MOLLOHAN:

. . . in order to fully man the space station and be able to do the things that we -- all of the scientifics actually being fully capable.

O'KEEFE:

It would help a lot to have orbital space plane. But we're not dependent exclusively on it. Shuttle can provide the crew transfer capacity necessary in that interim period. It's a much more efficient way to go about doing it though, using a crew transfer vehicle.

WALSH:

I think your time is up.

MOLLOHAN:

Thank you.

WALSH:

Mr. Knollenberg?

KNOLLENBERG:

Thank you, Mr. Chairman.

Mr. O'Keefe, I wanted to also join my colleague here, Mr. Goode, in affirmatively supporting the SATS program. And I know they kicked that up some possibly 50 percent. So we appreciate that.

I want to talk a little bit about this dark energy. And I know that maybe you're up to speed on that. I have to confess, I am not.

I got caught on the dais at the University of Michigan when that question came up on another subject. But this was one of the questions. And I quickly deferred to a gentleman from NASA, who took over.

I'm not so sure that any of us know entirely about what this is. But I find it -- my question, and I have a couple of questions.

One is: what are we going to do with this information? It's fascinating. It's extraordinary.

And the fact that they have pinpointed the age of the universe to be something like 13.7 billion years old, that's interesting. But what do we do with it?

Also that the big bang, those stars that were first ignited, happened much earlier, they say, than scientists expected. I don't know what we're going to do with that kind of information either. But I do believe that somewhere within this there is an excitement that would tell us that they did an amazing amount of work.

And the collaboration of the -- and I believe this was peer reviewed. It was competitively drawn, in that the best minds, the best scientists put this thing together. And they have all this information.

My question really would be, the chief one -- and this map, by the way, that they have, I've seen a tiny bit of that too. And that's kind of extraordinary.

But what have you learned from this partnership, perhaps, that has to do with the competitively designed program of getting all of the -- I think there were several universities, several entities at least, that were involved in this. And it got down to two.

It got down to -- what was it? Was it Harvard? I'm sorry, Princeton. It was Princeton and NASA that combined in the end.

So they've got this map. And it tells us something. It tells us some facts that are, I believe to be solid. But how do we build in this knowledge? Of what value is it right at this moment? And when does it become of greater value?

And I guess what decided, what forced you to decide or influenced you to even do this program in the first place? It was about $140 million, I believe. But would you just comment on where we're going with this information? How do we apply it? What do we do with it? And maybe learn something from it that suggests we might duplicate the process in some other areas, other programs.

O'KEEFE:

Yes, sir. Well, it is an effort called Wilkinson's Microwave Anisotropy -- a-n-i-s-o-t-r-o-p-y -- Probe. And yes, indeed, I have demonstrated -- and I am more in the category I mentioned earlier of one of those folks that got a degree in sports and exercise science than in engineering and scientific pursuit.

So yes, I find it handy to have scientists and engineers who can answer these much better than I. But the focus that I see to it, I

mean, reduce it down to the most fundamentals of what specific research efforts like this tell us, is it reverses what we thought we knew about the origins of this universe, which tells you a lot more about evolution in time.

It had been kind of an accepted notion among astronomers and others that there was the big bang theory, an acceleration of the expansion of the universe, and then a slowing down of that process. If anything, what this has demonstrated is that the big bang occurred much earlier than we thought it did. Derived an awful lot from the Hubble telescope images and understanding, given the speed of light and how far back into history, essentially, you can see.

And that this is not a deceleration of the expansion of the universe. It's accelerating. It's continuing to expand constantly, which is telling us a lot more about energy in many different directions.

Whether it has immediate applications to a variety of circumstances that we'll see useful today is a different question. But the speed in which we're accelerating our understanding of the creation of the universe, the formation, as well as continuing progression of it, identification of other planets, other comparable solar systems that have a dynamic much like our own, is just in the last couple of years is breaking through in that area.

So many astronomers have basically concluded that what they thought they knew in graduate school about the absolutes, the principles of astronomy, have changed. This is the course of the last 12 to 18 months and, in part, contributed by efforts like this, which is accelerating the pace of our understanding and learning to the point where this is the equivalent of folks tearing up their Flat Earth Society membership cards.

KNOLLENBERG:

I would hope so.

O'KEEFE:

And getting into an understanding much broader than that of the origins of the universe in a way that we never comprehended before.

WALSH:

Gentleman's time has expired.

KNOLLENBERG:

Has it expired?

WALSH:

Yeah, it was a 4.5 minute question, Joe.

(LAUGHTER)

KNOLLENBERG:

Well, I have a few questions then for the record. But I'll get those to you. But I do -- I am fascinated by this. And I still didn't get the answer I wanted from you, in terms of: are you applying this to other things? So we'll get into that by my . . .

O'KEEFE:

Oh, I'm sorry. Yes, sir. We definitely are and are trying to transport that application in lots of other areas. And the speed of that learning is accelerated by this action.

But I will provide a much greater response for the record, sir. Thank you.

WALSH:

Thank you. And I would remind all members that we can ask as many questions as we like, in any depth that we want, for the record and they'll respond. And we'll ask them to respond quickly.

It was a fascinating question. It was.

Mr. Price?

(LAUGHTER)

O'KEEFE:

It had my attention, Mr. Chairman.

PRICE:

Thank you, Mr. Chairman.

Mr. Administrator, let me pick up on the small aircraft transportation system referred to by both Mr. Goode and Mr. Knollenberg. We have shared an interest in this.

And it's good to observe that the SATS program seems to be moving forward more effectively now than it was last year at this time. And I appreciate the increased oversight that NASA has provided for the program.

If we can keep this program appropriately focused, I am convinced that SATS will give us an opportunity to help improve the economic outlook and the transportation options for many, many small communities in this country.

I want to take this opportunity, however, to make sure that we are completely on the same page with regard to the fiscal year 2003 report language on the conduct of the SATS regional service demonstrations. There are a number of members of this subcommittee who are closely watching the progress of SATS and

who are interested in seeing that the SATS concept is, in fact, translated into reality.

The only way that can occur is if we demonstrate with real planes and real passengers and real small airports that SATS can, in fact, work. It will take the involvement of local communities and the FAA and airplane manufacturers and state divisions of aviation and many others. It's going to require a partnership. It's something that takes a significant amount of preparation to carry out effectively.

Now the fiscal year 2003 report directed NASA and NCAM to fund automotive technology transfer efforts and to accelerate the planning of regional service demonstrations. And Congress provided an additional $6.3 million for these purposes.

Can you tell me specifically how these additional funds will be used, with a particular emphasis on how funds will be used for the service demonstrations?

O'KEEFE:

The $6.3 million will, in fact, be invested through the National Consortium for Aviation Mobility to accelerate the regional service demonstrations for the SAT technology and auto technology transfer efforts overall. So that's part of following through on that particular set of objectives. That's our intention, is to proceed in that direction.

The consortium, of course, is a joint-sponsored R&D effort, which was executed specifically with that consortium to develop and negotiate a consensus among all the partners over how the NASA research objectives will be satisfied in that case. So we are committed to that effort. And we'll work through the consortium to accomplish that task.

PRICE:

How much autonomy or independence does the consortium have in allocating these funds? A related question being, of course, the role that NASA plans to assume in overseeing this effort, of making certain that the intent of Congress, communicated via the report language, is carried out?

Let me say, I ask that question in the conviction that NASA is still responsible for adhering to the report language directives and for making sure the money is used appropriately. The funding for service demonstrations must not merely be split up among current members of NCAM, but it must be I nested in those NCAM members that will be able to meet Congress' mandate in this area.

That is, they have done the groundwork to carry out regional service demonstrations and they have formed the partnerships necessary with the state, with local communities, with transportation service providers, in order to do this successfully.

O'KEEFE:

Yes, sir. The approach that the consortium is taking, I am advised, is they are responsible for negotiating the roles that industry, universities, states and localities will play in the execution of the projects. But it is not just a divide up among the consortium members.

NASA maintains an oversight function and role and responsibility in that regard. And we are solely responsible for the safety of flight experiments, et cetera, that they will be pursuing on behalf of that effort.

So there is a more activist oversight role. And indeed, but they are the ones responsible for -- the consortium -- for making determinations about how the distribution will work among the industry, university and state and local partners.

PRICE:

Thank you.

Mr. Chairman, is my time expired.

WALSH:

You have one more minute.

PRICE:

Let me just then bore in a little bit on the answer you gave to Mr. Bishop earlier on commercial technology transfer. I will just -- I wanted just to ask you what the implications are of the elimination of something like 70 percent of the budget for spinning off technology are? I know you want to continue this in other ways. You want to delegate this to the private sector.

Justification seems to say that NASA will continue to manage and offer its intellectual property to industry. But I keep coming back to the fact that you are terminating almost all the very program that's been doing this work to date.

You have many innovative technologies emerging from NASA labs. They need to be assessed, protected, prepared for transfer to industry.

So is this budget request really going to allow you to continue to do that? It's just -- it doesn't sound to me like there is a well- thought out plan for how the agency is going to continue to carry out this transfer to the private sector.

So my question is: wouldn't it be more prudent to maintain the current technology transfer program until the agency has a better handle on whether it can continue to do technology transfer without the current NASA positions and the contract partners that you have slated for elimination?

O'KEEFE:

Well again, congressman, I think it is just a difference of view of how program management and implementation is best conducted on the effort of technology transfer. And is it borne of the fundamental theory that the public sector is fundamentally ill suited for the purpose of trying to forecast and ascertain what the right market opportunities might be and assume that those market forces will be much more adept and agile at that effort.

Again, that's not to say that the folks who are engaged in this haven't been really attentive to the task of trying. They really have. And I think it has been a very committed effort, trying to really diffuse or make sure that there is an infusion of the technology transfer capabilities into as many commercial opportunities as we know how.

But there is the rub. We don't know how nearly as well as those who are actually out there diagnosing market conditions are.

So instead, the approach we look to is to concentrate our effort more on the spin in of technology for applications we seek solutions to and then to facilitate the transfer of technology as spin-offs, in a way that would make the information, the data, the technology access, more universally accessible than trying to determine where we think certain technology solutions will fix or make capabilities better.

There is one classic example -- as a matter of fact, I heard it from our friends at Langley, who found a set of solutions to a problem that suddenly had a capability that had a fluid, mechanic kind of application, that found great applicability in the cosmetics industry. Nobody would have ever thought of that at NASA. Nobody would have sat back and said, "Let's see if we can talk to some of the cosmetics industry folks," in terms of how they can apply this capability for something it never would have imagined that kind of circumstance.

But by making that data and information available, they were able to utilize it and access it in a way that made it much more useful for that commercial enterprise, that commercial market pursuit, than what we ever could have forecast by the engineers and great scientists and technologists that we have. They never would have thought of that one.

WALSH:

The gentleman's time has expired.

Mr. Weldon -- Dr. Weldon?

WELDON:

Thank you, Mr. Chairman.

Mr. O'Keefe, I want to get back to the OSP issue. The four concepts that I saw being discussed, three of them were wing concepts that involve landing on a runway. And it would seem to me that, in terms of coming up with a robust system that is low cost, that the capsule concept would be the safest and least expensive route to go. And why don't we just move ahead with something like that?

With a winged lander, aren't we inviting a lot more opportunity for cost overruns? Aren't we looking at more potential problems with designing the thermal protection systems? Aren't there going to be a lot of issues in putting a winged vehicle on the nose of an Atlas or a Delta rocket?

And what is your assessment here of the pros and cons of all this?

O'KEEFE:

Thank you, sir. There isn't any one solution that we are wed to. The objectives are to develop a capability that can accomplish the very specific operational mission objectives of a crew transfer vehicle to the International Space Station, for as often and as responsive, as

flexible an operational capability as we can possibly get to establish crew rotation patterns for station.

And to, rather than have a permanently affixed station crew of any size or number, instead we have the capacity to be responsive when you need human intervention in laboratory or scientific or research pursuits when you need them. So that requires a responsiveness and a capability.

Any design those folks have right now that would meet that objective, we're for. That's a great idea. And that's why you hear, there are several companies, aerospace firms, that are coming up with lots of different design characteristics.

Our level one requirements can be summarized on one page. That's it. That's what they have. And that's what they've been told. "These are the things we needed to meet."

In additional to that operational characteristic, it also -- we really want this to be a next generation capability that can at least conquer one or two of the limitations we currently deal with. And as we talked a little bit earlier, the maneuverability character of the shuttle is not as extensive as we would like it to be or could be desirable for flexibility of launch.

The second is the launch window parameters that we deal with, again, as just a principle of orbital mechanics, means that the only way you can beat that is to have an asset that is as maneuverable as possible. The initial orbital space plane will go on an expendable launch vehicle, but not the future that we anticipate, would it be required or restricted to it.

WELDON:

You brought up the maneuverability issue when I asked my question earlier.

O'KEEFE:

Yes, sir.

WELDON:

And certainly, I understand the advantages of having a maneuverable concept. But that desire has to be played against obviously cost issues. It has to be played against safety issues.

It also has to be played against the practical reality that we're in a situation right now where it's unclear when the shuttle is going to be launched again. We are dependent upon the Russians. There are a whole host of issues associated with using the Russians.

And it would seem to me, from my perspective -- and obviously, I'm not an aeronautical scientist -- that the capsule concept is a very, very attractive way for us to get from here to there relatively quickly. I'm anxious to see what your team ultimately decides in all this.

But within the realities of the budgeting that we can anticipate, I would like to see a system that can come on-line soon and not late in the next decade. And to meet that kind of a requirement, we're going to have to be able to address some of these safety issues very, very effectively and, as well, some of the engineering issues.

And I bring all this up because if you look at the two shuttles that we've lost, the decisions that were made in the 1970s in the engineering and design of the shuttle appear to have been responsible for losing two crews. And of course, everybody sees clearly through retrospect. And I'm not pointing fingers or making fault.

But as we move forward with this, I think it's very, very important that your agency and this committee and the Congress look very, very closely at the right balance of all of these issues so that we are able to have that capability to support the station and do other missions instead of some kind of problem with the space shuttle.

O'KEEFE:

Yes, sir. That's fair enough. And again, I'm not predisposed towards a set piece answer.

The design effort that is going on for the next 12 to 18 months is going to tell the tale of the tape, if you will, on what the ultimate configuration of OSP will look like. And we're really trying to set it up, as much as we can, to challenge the industry to come back with solutions.

But to get the requirements right, there are just two things we're looking for. It's got to have a crew transfer vehicle capacity to get roundtrip, to and from station, on a regular, flexible, agile basis. And the other primary requirement -- again, the list of requirements are specific and only fit on that one page -- is that it has to have certain characteristics that will be developmental.

If we only wanted to -- if we end up, in the end, deciding that the larger of the objectives is the operational mission imperatives of crew transfer vehicle, we may end up in a direction that will be much more known, lower-risk, lower-cost technologies. But this is also an opportunity to test it and to demonstrate technology and capabilities to do something we haven't yet done, which is to achieve maneuverability, achieve some flexibility, some in-space propulsion capacity -- all the things that have just really bedeviled us so far.

It's worth the effort to try to do a little bit of both. But in the process, avoid what has been the historic -- recent historic -- maladies that we have pursued, which is to try to design something that's going to cover everybody's requirement and, in the process of doing so, accomplishes none of them. That's been our history of late.

And so rather than trying to go that route of trying to eat the whole elephant, it's a case of: let's try to focus on one or two major objectives, while at the same time, achieving that mission objective requirement for support of International Space Station. That will be a good day if we can get that far.

WALSH:

The gentleman's time has expired.

Mr. Goode?

WALSH:

If there are no questions, I have one more. And if anyone else would like to stay and ask another question, we'll ask the administrator to stay. We're getting close to the end, though.

On March 19th and 20th, NASA held a long-planned summit to address the needs associated with the shuttle service life extension program. The stated goal of the summit was to answer basic questions of what shuttle investments are required to perform the NASA mission.

In the past, NASA's budget has presented the Congress with a long list of upgrades to shuttle fleet, with only a small portion funded. And more than once, the upgrades approved by the Congress were not completed for reasons ranging from incomplete technology development to escalating costs.

How will the summit process you have initiated improve the quality of the product the Congress has for its evaluation?

O'KEEFE:

The two areas that we have really focused on as to why we got everybody together to do this is first to establish some priorities. Every shuttle upgrade that's been advocated or proposed in the past seems to have equal standing.

And so if everything is number one on the chart, it means nothing is number one. And there is no prioritization. And not all upgrades are really going to add to safety or efficiency or whatever else.

So this is really a more disciplined effort to say: let's inventory everything out there that folks think will contribute to safety enhancement, efficiency, performance and survivability capabilities for shuttle for a sustained period of time. And let's get those in priority order and understand what the consequences are of each of them, in terms of cost, schedule, challenge of implementation, all of those things which so far have been handled one by one or one each or done in a more random way, as they have developed. So this is infusing a little more discipline into that process of how we plan for those.

The second one is to really focus and concentrate on: how do we sustain this capability for a longer period of time? Until a year ago, at least the underpinning objectives that were incorporated into the integrated space transportation plan, such as it was, is the assumption of a retirement of shuttle by the early part of the next decade, with absolutely no plan for what we would do thereafter. How do we support station and whatever else?

So the objective here has been to think more in terms of: how do I develop a continuing operational asset that will pick up largely the role that it does so impressively, which is heavy lift cargo capacity, move more in the direction of crew transfer vehicle and capability through the orbital space plane or other alternatives that may emerge from that endeavor, and think about how we use this asset more specifically, towards those kinds of goals, as opposed to trying to have it do all things to all people? So how do you maintain the service life of it, at as low a risk and as safely as we can do it, and give you a more coherent prioritization order with some cost, schedule, all the other management things attendant to it, as opposed to a random generator of shuttle ideas or upgrade ideas?

WALSH:

When we went down to the launch back on February 16th, you were very pleased that you had just received your audits back from OMB,

I believe. And would you like to talk about the result of that? You really haven't had a chance to spend much time on that one.

O'KEEFE:

Thank you, sir. It kind of -- among the things that we've talked about here today, I was thinking to myself, last year was occupied with a lot of attention on International Space Station and why we had a disclaimed opinion from our outside auditor, Pricewaterhousecoopers, that the General Accounting Office said, "That's it. Can't even determine what was in the books."

We have a clean opinion this year. It was achieved in January, prior to February 1st, and therefore got a footnote after the events of that date.

But that was a really Herculean effort over the course of a year to straighten out the books of the agency, to be able to have them auditable. The same firm came in and audited them, Pricewaterhousecoopers, and was attested to by all of our external audit functions involved as being compliant.

So that's a turnaround from a disclaimed opinion to an unqualified, certified opinion that was released this year, and one that I think is part of the effort. You know, our integrated financial management program is something we're going to anticipate, year after year, we'll be looking to in the future to be modern, contemporary, financial practices, just like you would expect of any other organization or company.

So thank you, sir. Appreciate the opportunity to talk about that a little bit.

WALSH:

Thank you. And congratulations to you.

O'KEEFE:

Thank you.

WALSH:

Mr. Mollohan?

MOLLOHAN:

Mr. Chairman.

In the last line of questioning, administrator, you indicated that the development of the orbital space plane is very important to our getting to full operability and capability of the station. In your request for -- I don't know, level one request or whatever it is, your initial -- one of the requirements is that it have an ability to transport a minimum of four astronauts.

How does that -- that doesn't sound to me like that facilitates the operation of the station at its full capability. I mean, if you're only going to be able to transport four astronauts, how can it even be a return -- emergency return vehicle for seven?

O'KEEFE:

The idea is that you don't put all your eggs in one basket. If we have an operational, flexible, dynamic vehicle that is able to launch on near demand, is maneuverable, you can launch it as many times as you need and as many of them as you need to meet whatever crew complement is necessary. I mean, the notion that there would be some fixed, permanent crew size aboard station is something we're still working through, in terms of what that ought to be.

But more importantly, what the scientists are -- and the Office of Biological and Physical Research folks, et cetera are -- coming back and advising is we ought to have the surge capacity to be able to have a substantially larger number of humans aboard this laboratory condition when you need human intervention.

MOLLOHAN:

Larger than what?

O'KEEFE:

Larger than seven, whatever number you need in order to accomplish that full range. So rather than have a capability that is sized of how many folks do you have? Can you get them all in one vehicle and fly them all back? The approach is to have multiple vehicles that can bring whatever number that you need at any given time.

MOLLOHAN:

Are you imaging those being on station?

O'KEEFE:

Yes.

MOLLOHAN:

A number of these vehicles on station?

O'KEEFE:

Yes. Potentially two or more. Yes. And an emergency egress capsule or any number of other combinations. We're trying to get out of this monolithic approach that says one thing is going to do it all and starting to think in terms of: how do you have as much flexibility of asset to accommodate that? And at present time, if you're looking at a combination, say, of one OSP with four individuals, one Soyuz capsule with three, that covers whatever the crew size might be.

MOLLOHAN:

What is the main concern of the NASA Advisory Council? And I know they have expressed some pointed concerns to you about this development of the orbital space plane for these purposes. What are their main concerns? And how do you address them?

O'KEEFE:

I think the discussion, as a matter of fact, that Congressman . . .

MOLLOHAN:

I'm sorry if I missed the answer.

O'KEEFE:

No, not at all. Not at all. The discussion that Congressman Weldon and I had is probably the best characterization of the nature of the issues that the NASA Advisory Council has come back.

The thoughtful folks are saying, "What do you really want to do here? Do you want to make this a technology demonstrator? Or do you want to make it an operational vehicle?"

And the answer is, we want to try to get as much of both of those circumstances as you can. And there are some who are stronger advocates for saying get to a near-term solution. And that may yet be the answer, on a capsule.

And others who say, "No, no, no. You focus too much on the near-term immediacy of the current problems. You've got to think bigger, longer term. Let's start thinking about how you get a technology demonstration capacity that gets you out of low Earth orbit, potentially." And that's a way stretch.

But what we're looking for, I think, is a modest combination of both that, at once, provides a dynamic, flexible capacity, which we don't have today. And in addition, that stretches some technology to beat

some technical limitations we currently have so we can apply that for the next generation.

MOLLOHAN:

Okay, that's kind of a general answer. Did they have more specific concerns that you had more specific responses to?

O'KEEFE:

Let me give you an inventory of the last meeting we had on this specific topic for the record. But those are the -- that's as specific as I remember the debate being among and between folks. Because again, it went the range.

MOLLOHAN:

Thank you, Mr. Administrator.

Let me ask you some short-term issues here. I understand Russia has proposed doubling its budget for space and arguably, would have enough money to produce these Soyuz Progress vehicles. Do you think they will? Do you anticipate that they will, on their own, manufacture these and deliver them for use? And what contingencies do you have in mind if they don't?

O'KEEFE:

I had an extended discussion yesterday with Yuri Koptev, the director general of Rosaviakosmos. They are proceeding with the plan we had agreed to, as partners, which is replacement of Expedition Six with a two-person crew on the 26th of April. And we're going to see that return.

He is accelerating the efforts necessary in order to continue to produce Progress logistics vehicles, unmanned logistics vehicle, for the time ahead. There is no question the Russians are anxious to see further partner participation, as we all are. And that series of

discussions continues in terms of what burden everyone will be shouldering in that task.

But what he and I agreed to -- and he clearly understands -- is that we are really fixated on what it's going to take to return to flight. And if in this interim period of time, the partnership can step up and be partners in this partnership arrangement, that will bode well for the future of this program.

I am satisfied that his commitment and that Russia's obligations to their commitment is sustaining. And they are going to step up to this challenge. And as recently as yesterday, there is no question in my mind that they are focused on that imperative in this near-term period, to assure that we can return to flight as successfully and as expeditiously and as safely as we know how.

MOLLOHAN:

Did I hear you saying you anticipate that they would meet their obligations. And to the extent that that might not quite happen, that your contingency is that the other partners would step forward with some contributions?

O'KEEFE:

Yes, that's a continuing effort in the negotiations, yes. But in the near-term, they're clearly stepping up to their responsibilities. I'll be over there in a few weeks, as a matter of fact, working through the remaining details of this. But there is little doubt in my mind that they see a very strong responsibility and a very strong commitment to this program.

MOLLOHAN:

Thank you, Mr. Chairman.

Thank you, Mr. Administrator. And thank you for your good work, the whole agency, under very trying times, and for your testimony here today.

Thank you, Mr. Chairman.

O'KEEFE:

Thank you, congressman.

WALSH:

Thank you.

Dr. Weldon, you will have the last word.

WELDON:

Thank you, Mr. Chairman. Actually, I want to follow up on a line of questioning you were asking, Mr. Chairman, regarding the shuttle service life extension program. You had the . . .

O'KEEFE:

Oh, I was hoping you would talk about the financial audits again.

(LAUGHTER)

WELDON:

Actually, I had a question about that too, but the chairman covered it.

You had the first meeting down there in New Orleans, I understand. And was there any major development that emerged from that, that you just want to share with us now? Or is it too early to say where it's all going to go?

O'KEEFE:

Yes, sir. Thank you.

The effort really was to agree to a process and get all the actors and players in the activity together, which they did at the Michoud facility in Louisiana, a couple, three weeks ago, with the objective of: here's how we're going to start working through a process in order to yield the kinds of answers to the questions the chairman posed.

WELDON:

So you would expect in the future we'll see some definite recommendations that will come out of this process?

O'KEEFE:

By June. By June, was their agreement. So I'm really anxious to see the results of this effort, which they're continuing. And it's going on now.

WELDON:

I am, as well.

I just have one additional question. As you know, part of the success of our military in the field of combat in Iraq has been the extensive utilization of space technologies and space assets. As I understand it, NASA does accommodate a fair number of graduate students in various programs within the agency, some of which come from Middle Eastern and other countries that have had problems with terrorism.

Do you have any type of program within NASA that monitors where these students are and what kind of access to technology that they have?

O'KEEFE:

Yes, sir. As a matter of fact, this is a source of -- I wouldn't say great controversy, but it is a human resource management challenge that we're constantly wrestling with. Because on the one hand, as we talked a little bit about here, there is a real challenge that we're about to confront -- and are staring at -- on the engineering, scientific and technology-related disciplines. And yet at the same time, we really have to be mindful of exactly the export control and technology transfer kind of concerns that I think you're pointing to.

So it limits, in many ways, the kind of access that we can provide to our professional workforce, depending on nationality in some cases. And it makes it extremely difficult to work through on a variety of cases, as well as the issue of trying to manage where those talents are going to come from in the future.

So this is not an insignificant factor. And I don't have any real clear answers, in terms of how we conquer this. It's tough.

WELDON:

Do I understand you to say you are working on this issue?

O'KEEFE:

That's about as good as I can tell you. It's very, very hard.

WELDON:

Well, I would encourage you and you team to work through it and come up with the necessary safeguards to ensure that critical technologies do not end up in the wrong hands.

O'KEEFE:

Indeed.

WELDON:

Thank you, Mr. Chairman.

O'KEEFE:

Thank you, congressman. Appreciate the questions.

WALSH:

Well, that concludes our hearing. I think everyone had a full opportunity to ask their questions.

I thank you, Mr. O'Keefe, for your forthright responses. I congratulate your staff on preparing you well for today. And I would ask that any questions submitted for the record, that you provide responses to those as quickly as possible so we can get this bill ready for the floor.

Thank you very much. The hearing is adjourned.

CQ Transcriptions, April 8, 2003

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